HEWLETT PACKARD

OPERATING AND SERVICE MANUAL

86290B
RF PLUG-IN
2.0 — 18.6 GHz
Includes Options 004 and 005

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed 1704A.

For additional important information about serial numbers see INSTRUMENTS COVERED BY MANUAL in Section I.

MANUAL PART NO. 86290-90028
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CONTENTS

SECTION I
GENERAL INFORMATION

1-1. INTRODUCTION

1-2. This Operating and Service manual contains information required to install, operate, test, adjust, and service the Hewlett-Packard Model 86290B RF Plug-in. Figure 1-1 shows the instrument and accessories supplied. This section covers instrument identification, description, options, accessories, specifications, and other basic information.

1-3. This manual is divided into eight sections which provide information as follows:

a. SECTION 1, GENERAL INFORMATION, contains the instrument description and specifications as well as the accessory and recommended test equipment list.

b. SECTION II, INSTALLATION, contains information relative to receiving inspection, preparation for use, mounting, packing, and shipping.

c. SECTION III, OPERATION, contains operating instructions for the instrument.

d. SECTION IV, PERFORMANCE TESTS, contains information required to verify that instrument performance is in accordance with published specifications.

e. SECTION V, ADJUSTMENTS, contains information required to properly adjust and align the instrument after repair.

f. SECTION VI, REPLACEABLE PARTS, contains information required to order all parts and assemblies.

g. SECTION VII, MANUAL CHANGES, contains backdating information to make this manual compatible with earlier equipment configurations.

h. SECTION VIII, SERVICE, contains decriptions of the circuits, schematic diagrams, parts location diagrams, and troubleshooting procedures to aid the user in maintaining the instrument.

I-4. Supplied with this manual is an Operating Information Supplement. The Supplement is a copy of the first three sections of this manual, and should be kept with the instrument for use by the operator. Additional copies of the Operating Information Supplement can be ordered through your nearest Hewlett-Packard office. The part number is listed on the title page.

I-5. Also listed on the title page of this manual is a Microfiche part number. This number can be used to order 4 x 6-inch microfilm transparencies of the manual. Each microfiche contains up to 60 photo-duplicates of the manual pages. The microfiche package also includes the latest Manual Changes supplement as well as all pertinent Service Notes.

1-6. SPECIFICATIONS

1-7. Instrument specificaions are listed in Table 1-1. These specifications are the performance standards or limits against whch the instrument is tested. Table 1-2 lists supplemental characteristics. Supplemental characteristics are not specifications but are typical characteristics included as additional information for the user.

1-8. SAFETY CONSIDERATIONS

1-9. General

1-10. Before operating this instrument, you should familiarize yourself with the safety markings on the instrument and safety instructions in this manual. This instrument has been manufactured and tested according to international safety standards.

1-11. Safety Symbols


Instruction manual symbol: the apparatus will be marked with this symbol when it is necessary for the user to refer to the instruction manual in order to protect the apparatus against damage.


Indicates dangerous voltages.


Earth Terminal.

WARNING

The WARNING sign denotes a hazard. It calls attention to a procedure, practice, or the like, which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.

CAUTION

The CAUTION sign denotes a hazard. It calls attention to an operating procedure, practice, or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the equipment. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met.

1-12. Operation

1-13. BEFORE APPLYING POWER, refer to SAFETY CONSIDERATIONS in Section 1 of the Operating and Service manual for the mainframe.

The information, cautions, and warnings in this manual must be followed to ensure safe operation and to keep the instrument safe.

WARNING

BEFORE SWITCHING ON THE INSTRUMENT, the protective earth terminal of the mainframe must be connected to the protective conductor of the (mains) power cord. The mains plug should only be inserted in a socket outlet provided with protective earth contact. This protection should not be negated by using an extension cord (power cable) without a protective grounding conductor. Grounding one conductor of a two-conductor outlet is not sufficient protection.

WARNING

Any interruption of the protective (grounding) conductor, inside or outside the instrument, or disconnection of the protective earth terminal could make this instrument dangerous. Whenever it is likely that this protection has been impaired, the instrument should be made inoperative and secured against any unintended operation.

WARNING

BEFORE SWITCHING THE INSTRUMENT ON, ensure that all ac line powered devices connected to the instrument are connected to the protective earth ground.

CAUTION

BEFORE APPLYING POWER, make sure the mainframe ac input is set for the available ac line voltage, that the correct fuse is installed, and that all normal safety precautions have been taken.

1-14. Service

1-15. The information, cautions, and warnings in this manual must be followed to ensure safe operation and to keep the instrument safe. SERVICE AND ADJUSTMENTS SHOULD BE PERFORMED ONLY BY QUALIFIED SERVICE PERSONNEL.

1-16. Adjustment or repair of the opened instrument with the ac power connected should be avoided as much as possible but, when unavoidable, should be performed only by qualified service personnel who are aware of the hazard involved.

1-17. Capacitors inside the instrument may still be charged even though the instrument has been disconnected from its source of supply.

WARNING

Servicing this instrument often requires working with the instrument's protective covers removed and ac power connected. Extreme caution should be exercised since energy available at many points in the instrument may, if contacted, result in personal injury.

WARNING

BEFORE SWITCHING THE INSTRUMENT ON, ensure that all ac line powered devices connected to the instrument are connected to the protective earth ground.

1-18. INSTRUMENTS COVERED BY MANUAL

1-19. Attached to the instrument is a serial number plate (Figure 1-2). The serial number is in two parts. The first four digits and letter are the serial number prefix; the last five digits are the suffix. The prefix is the same for all identical instruments; it changes only when a change is made to the instrument. The suffix, however, is assigned sequentially and is different for each instrument. The contents of this manual apply to instruments with the serial number prefix(es) listed under SERIAL NUMBERS on the title page.

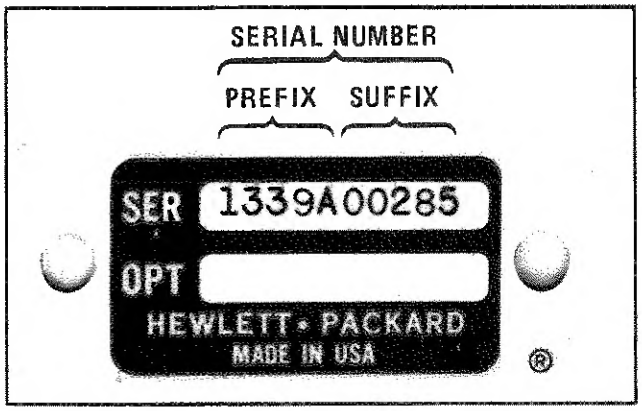


Figure 1-2. Serial Number Plate

1-20. An instrument manufactured after the printing of this manual may have a serial number prefix that is not listed on the title page. This unlisted serial number prefix indicates the instrument is different from those described in this manual. The manual for this newer instrument is accompanied by a yellow Manual Changes supplement. This supplement contains "change information" that explains how to adapt the manual to the newer instrument.

1-21. In addition to change information, the supplement may contain information for correcting errors in the manual. To keep this manual as current and accurate as possible, Hewlett-Packard recommends that you periodically request the latest Manual Changes supplement. The supplement for this manual is identified with this manual's print date and part number, both of which appear on the manual's title page. Complimentary copies of the supplement are available from Hewlett-Packard.

1-22. For information concerning a serial number prefix that is not listed on the title page or in the Manual Changes supplement, contact your nearest Hewlett-Packard office.

1-23. DESCRIPTION

1-24. The HP Model 86290B is designed as a plug-in for the 8620C mainframe. The mainframe and 86290B RF Plug-in make up a solid-state sweep signal source with a frequency range of 2.0 – 18.6 GHz. The frequency range is swept in either one continuous band or in three single bands. In single band operation, Band 1 sweeps 2.0 – 6.2 GHz, Band 2 sweeps 6.0 – 12.4 GHz, and Band 3 sweeps 12.0 – 18.6 GHz. When Band 4 is selected on the mainframe, the full frequency range of 2.0 – 18.6 GHz is swept continuously. The fundamental frequency of 2.0 – 6.2 GHz is generated by a YIG Tuned Oscillator (YTO). A YTO test signal (typically –10 dBm) is available at the rear panel AUX OUT connector. A YIG Tuned Multiplier (YTM) provides the frequency range from 6.0 to 18.6 GHz.

1-25. The RF output of the instrument is controlled by the front panel POWER LEVEL control. Power can be leveled, externally or internally, across the band using a conventional power sampling and feedback technique. The automatic level control (ALC) switch selects the mode of leveling either internal (INT), external crystal (EXT), or power meter (MTR). A front panel EXT INPUT connector and ALC GAIN control are provided to use with an external leveling loop. When the UNLEVELED light is on, it indicates that the leveling loop is open over a portion of the swept band. BNC connectors on the rear panel allow for external FM signal inputs, a 1 V/GHz frequency reference voltage output, and a SEQ SYNC timing signal.

1-26. Options for the Model 86290B RF Plug-in are available to (1) substitute a rear-panel RF OUTPUT connector and also route the EXT INPUT connector to the rear panel and (2) provide a front-panel or rear-panel APC-7 RF OUTPUT connector.

1-27. Option 004

1-28. The 86290B Option 004 has the RF OUTPUT and ALC EXT INPUT connectors mounted on the rear panel instead of the front panel. Installation information may be obtained from the nearest Hewlett-Packard Field Service center. Installation of the Option 004 requires the parts listed in Table 1-3.

1-29. Option 005

1-30. The standard 86290B RF Plug-in uses a Type-N RF OUTPUT connector. The 86290B Option 005 provides an APC-7 OUTPUT connector. See Table 1-3 for parts required to install Option 005.

1-31. ACCESSORIES SUPPLIED

1-32. Figure 1-1 shows the HP Model 86290B RF Plug-in, the four dial scales to be mounted in the mainframe, the RF Test Cable (HP Part No. 86290-60032) for testing and troubleshooting the RF Section, and an extender board (HP Part No. 86290-60020) to extend printed-circuit boards for troubleshooting. The four scales supplied are as follows: 2.0 – 6.2 GHz, HP Part No. 86290-00014; 6.0 – 12.4 GHz, HP Part No. 86290-00015; 12.0 – 18.6 GHz, HP Part No. 86290-00040; and 2.0 – 18.6 GHz, HP Part No. 86290-00041.

1-33. EQUIPMENT REQUIRED BUT NOT SUPPLIED

1-34. To have a complete operating sweep oscillator unit, the Model 86290B RF Plug-in must be installed in an 8620C mainframe.

NOTE

All 86290B operation and maintenance procedures in this manual are set up using the HP Model 8620C mainframe. The 86290B will not operate with an 8620A or 8620B mainframe.

1-35. EQUIPMENT AVAILABLE

1-36. SERVICE ACCESSORIES

1-37. A service Accessories package for the 86290B RF Plug-in is available for convenience in aligning and troubleshooting the mainframe and RF Plug-in. The Service Accessories Package as shown in Figure 1-3, contains a plug-in extender cable, two service boards, and an adjustment tool. The package may be obtained from Hewlett-Packard by ordering HP Part Number 08620-60124.

1-38. Reversing Extender Board

1-39. A reversing extender board (Figure 1-4) is available for adjusting and troubleshooting when two circuit boards are extended at the same time. The reversing extender board is especially convenient when two adjacent boards are extended. This allows simultaneous access to the components of both boards. One board is extended on the reversing extender board with a second board on the standard extender board (Figure 1-1). The board may be obtained from Hewlett-Packard by orderingPart No. 86290-60033.

1-40. RF Section 36-Pin Extender

1-41. A 36-pin extender is available for extending the RF Section approximately 1 inch. This allows easy access to components located near the front of the instrument. This extender, shown in Figure 1-5, may be obtained from Hewlett-Packard by ordering Part No. 08621-60056.

1-42. Model 8755B/182T Swept Amplitude Analyzer and Oscilloscope

1-43. The Model 8620C/86290B Sweeper is compatible with the Hewlett-Packard Model 8755B Swept Amplitude Analyzer. For all swept amplitude measurements, the 27.8 kHz squarewave modulation is applied directly to the 8620C rear-panel EXT AM connector. This eliminates the need for an external modulator, thus providing maximum available power to a test setup.

1-44. Power Meters and Crystal Detectors

1-45. The Hewlett-Packard Model 432A Power Meter may be used for external leveling of the Model 86290B Plug-in RF Output Power. Externally leveled power is also available using an HP 8470B Crystal Detector. Section III contains detailed instructions for using the external power leveling systems.

1-46. Model 8410B/8411A Network Analyzer

1-47. The Model 8620C/86290B Sweeper provides multi-octave phase/gain measurement capability with the Hewlett-Packard Model 8410B Network Analyzer System. The combination of the Model 8410B Network Analyzer, the Model 8411A Frequency Converter, and an appropriate display plug-in forms a phase meter and a ratio meter for direct phase and amplitude ratio measurement on RF voltages. These measurements can be made on single frequencies and on swept

frequencies from 2.0 to 18.0 GHz. The interfacing between the 8410B and 8620C/86290B sweeper permits the 8410B to phase lock over the 2.0 to 18.0 GHz range. Sweep timing pulses for the 8410B Network Analyzer are available at the rear-panel SEQ SYNC connector.

1-48. RECOMMENDED TEST EQUIPMENT

1-49. Equipment required to maintain the Model 86290B is listed in Table 1-4. Other equipment may be substituted if it meets or exceeds the critical specification listed in the table.

Table 1-1. Specifications for 86290B Installed in 8620C (1 of 2)

SPECIFICATIONS[1]				
	Band 1	**Band 2**	**Band 3**	**Band 4**
FREQUENCY				
Range:	2.0 – 6.2 GHz	6.0 – 12.4 GHz	12.0 – 18.6 GHz	2.0 – 18.6 GHz
Accuracy (at 25° C):[2]				
CW Mode[3] (or Sweep Time > 0.1 sec with FM switch in PL or FM):	±20 MHz	±20 MHz	±20 MHz	±80 MHz
All Sweep Modes:	±30 MHz	±30 MHz	±30 MHz	±80 MHz
Marker:	±30 MHz	±30 MHz	±30 MHz	±80 MHz
Stability:				
Temperature Change:	±0.5 MHz/°C	±1.0 MHz/°C	±1.5 MHz/°C	±2.0 MHz/°C
10% Line Voltage Change:	±100 kHz	±100 kHz	±100 kHz	±100 kHz
10 dB Power Change from Specified Maximum Power:	±200 kHz	±400 kHz	±600 kHz	±600 kHz
3:1 Load SWR, all phases:	±100 kHz	±200 kHz	±300 kHz	±300 kHz
Residual FM (in 10 kHz bandwidth; FM-NORM-PL switch in NORM position):				
CW Mode:	<10 kHz peak	<20 kHz peak	<30 kHz peak	<30 kHz peak
POWER OUTPUT				
Maximum Leveled Power (25°C):[8]	>+10 dBm (10 mW)	>+10 dBm (10 mW)	>+10 dBm (10 mW)	>+10 dBm (10 mW)
Power Variations (at maximum leveled power):				
Internally Leveled:[9]	<± 0.7 dB	<± 0.7 dB	<± 0.8 dB	<± 0.9 dB
Externally Leveled[4]				
Crystal Detector:	<±0.15 dB	<±0.15 dB	<±0.15 dB	<±0.15 dB
Power Meter:[5]	<±0.15 dB	<±0.15 dB	<±0.15 dB	<±0.15 dB
Spurious Signals (below fundamental at specified maximum power, 2–18.6 GHz):				
Harmonically Related Signals:	> 25 dB	> 25 dB	> 25 dB	> 25 dB
Nonharmonics:	> 50 dB	> 50 dB	> 50 dB	> 50 dB
Residual AM: AM noise in 100 kHz bandwidth (below fundamental at specified maximum power):	> 55 dB	> 55 dB	> 55 dB	> 55 dB
Source SWR, 50Ω Nominal Impedance, 2 – 18 GHz: Internally Leveled:	<1.9:1	<1.9:1	<1.9:1	<1.9:1
MODULATION				
External FM: Maximum Deviations for Modulation Frequencies:				
DC to 100 Hz:	±75 MHz	±75 MHz	±75 MHz	±75 MHz
100 Hz to 2 MHz:	± 5 MHz	± 5 MHz	± 5 MHz	± 5 MHz

Table 1-1. Specifications for 86290B Installed in 8620C (2 of 2)

SPECIFICATIONS[1]				
MODULATION (Cont'd)	**Band 1**	**Band 2**	**Band 3**	**Band 4**
Sensitivity (nominal):[6]				
FM Mode (FM-NORM-PL switch in FM position):	−20 MHz/V	−20 MHz/V	−20 MHz/V	−20 MHz/V
Phase-Lock Mode (FM-NORM-PL switch in PL position):	−6 MHz/V	−6 MHz/V	−6 MHz/V	−6 MHz/V
External AM (at specified maximum power):[7]				
ON/OFF Ratio:	>30 dB	>30 dB	>30 dB	>30 dB
Symmetry:	40/60	40/60	40/60	40/60
Attenuation for +5 volt Input:	30 dB	30 dB	30 dB	30 dB
Internal AM (below maximum leveled power):				
1 kHz squarewave ON/OFF Ratio:	>25 dB	>25 dB	> 25 dB	> 25 dB
RF Blanking ON/OFF Ratio:	> 30 dB	>30 dB	> 30 dB	> 30 dB

[1] All specifications are at 25 degrees C. Allow 30 minutes warmup time.

[2] See also the Supplemental Characteristics, Table 1-2.

[3] Approach desired frequency from low-frequency end of band.

[4] Excluding coupler and detector variation.

[5] Use HP Model 432A power meter. Sweep duration > 10 seconds.

[6] A positive input voltage decreases frequency.

[7] Specific requirements for compatibility with HP 8755A, ±6V, 27.8 kHz square wave MODULATOR DRIVE output connected to external AM input.

[8] Subtract 0.5 dB for Option 004.

[9] Add 0.1 dB for Option 004.

Table 1-2. Supplemental Characteristics for 86290B Installed in 8620C (1 of 2)

SUPPLEMENTAL CHARACTERISTICS

NOTE: Values in this table are not specifications but are typical characteristics included for user information.

	Band 1	Band 2	Band 3	Band 4
FREQUENCY				
Linearity: (Correlation between frequency and SWEEP OUT voltage in MANUAL mode): Sweep Time >0.1 sec:	±8 MHz	±8 MHz	±8 MHz	±30 MHz
Drift: (10 minute period after 30 minute warmup):	± 300 kHz	± 600 kHz	±900 kHz	± 900 kHz
POWER OUTPUT				
Power Level: Stability with temperature change:	±0.1 dB/°C	±0.1 dB/°C	±0.1 dB/°C	±0.1 dB/°C
Power Level control range while maintaining 60-40 symmetry of internal 1 kHz square wave):	>10 dB	>10 dB	>10 dB	>10 dB
MODULATION				
External AM (at specified maximum power): Rise Time:	<1.5 μsec	<1.5 μsec	<1.5 μsec	<1.5 μsec
Internal AM: Sweep Time (at maximum sweep speed):	10 msec	10 msec	10 msec	10 msec
CW Remote Programming Settling Time: (FM switch in PL or FM):	5 msec	5 msec	5 msec	10 msec

GENERAL

Crystal Input: Approximately 50 to 750 mV for specified leveling at rated output; for use with negative polarity detectors such as HP Model 780 series Directional Detectors, and HP Models 8470 and 8472 series Crystal Detectors.

Switch Points (Band 4 selected): Broadband switch points are at 6.2 and 12.4 GHz. Frequency overlap is nominally 0 to 20 MHz at switch points.

Frequency Reference Output: Typically 1V/GHz ±0.035V; available at rear-panel FREQ REF connector.

Table 1-2. Supplemental Characteristics for 86290B Installed in 8620C (2 of 2)

GENERAL (Cont'd)

Fundamental Oscillator: YIG Tuned 2.0 to 6.2 GHz Oscillator. Oscillator signal available at rear panel AUX OUT connector, typically −10 dBm.

Net Weight: 9.6 pounds (4,4 kg).

Shipping Weight: 13 pounds (5,9 kg).

Dimensions: Height: 5 inches (12,7 cm); Width: 5-13/16 inches (14,7 cm); Depth: 12 inches (30,5 cm).

Options:

Option 004: Rear Panel RF Output.
Option 005: APC-7 RF Output Connector.

Table 1-3. Parts Required for 86290B Options

Option	Reference Designator	HP Part No.	Description
004		86290-00004	Panel: Front Lower
		86290-00023	Cover: Rear Panel
	W11	86290-20031	RF Cable: RF Coupler to Output
	J9	86290-60005	Connector: Rear RF Output
	J10	1250-0118	Connector: Rear EXT ALC INPUT
005	J1	86290-60007	Connector: APC-7

Table 1-4. Recommended Test Equipment (1 of 2)

Instrument	Critical Specifications	Recommended Model	Use*
Sweep Oscillator	No substitute mainframe	HP 8620C	P,A,T
Spectrum Analyzer (with external mixer)	Frequency Range: 2.0 GHz to 40 GHz	HP 8555A/8552B/141T HP 11517A	P
Oscilloscope with Dual-Trace Vertical Amplifier	Vertical Amplifier: Dual trace with 10:1 probes Bandwidth: 20 MHz minimum Vertical Sensitivity: 5 mV/Div Horizontal Sweep Rate: 1 μs/Div minimum	HP 182C/1801A/1820C	P,A,T
10:1 Divider Probe	For use with Oscilloscope	HP 10004A	A,T
DC Digital Voltmeter	Range: –50V to +50V Accuracy: ±0.004% Input Impedance: 10 megohms minimum	HP 3460B	A,T
Swept Amplitude Analyzer and Oscilloscope Mainframe	Frequency Range: 100 MHz to 18.6 GHz	HP 8755B/182T	A
Detectors (2 required)	Frequency Response: 0.1 – 18.6 GHz, Error < 1.3 dB Impedance: 50 ohms	HP 11664A	A
Frequency Counter	Range: 2.0 to 18.6 GHz	HP 5340A, Option H10	P,A
Function Generator	Frequency: 10 Hz to 2 MHz Output: 6V p-p into 50 ohms	HP 3310A	P,A
RMS Voltmeter	Scale: RMS volts Range: 0 to –70 dB Accuracy: ±5% Frequency Range: 10 Hz to 100 kHz	HP 3400A	P
Power Meter/Thermistor Mount and 10-dB Attenuator	Frequency: 100 MHz to 18.6 GHz Range: +10 dBm to –20 dBm	HP 432A/8478B, H-32**	P,A
DC Power Supply	Range: 0 to 10 Vdc Current: 0.1 Amp	HP 721A	P
Adjustable AC Line Transformer	Output: 100 to 150 Vac Power: 150 watts	General Radio MT3A	P
Frequency Meter	Range: 2.0 to 4.2 GHz	HP 536A	P
Frequency Meter	Range: 3.7 to 12.4 GHz	HP 537A	P,A
Frequency Meter	Range: 12.4 to 18.6 GHz	HP P532A	P
Adapters (2 required)	Type N Female to Waveguide	HP P281B, Option 013	P
Power Splitter	Frequency: 2 – 18.6 GHz Attenuation in each arm: 6 dB	HP 11667A	P
Directional Coupler	Freq: 2.0 – 18.6 GHz Coupling: 20 dB Directivity: >25 dB SWR all ports: < 1.3 Type-N Male Connector at Input port Type N Female Connectors at Output and Auxiliary Ports.	HP 11691D, Option C0-2	P

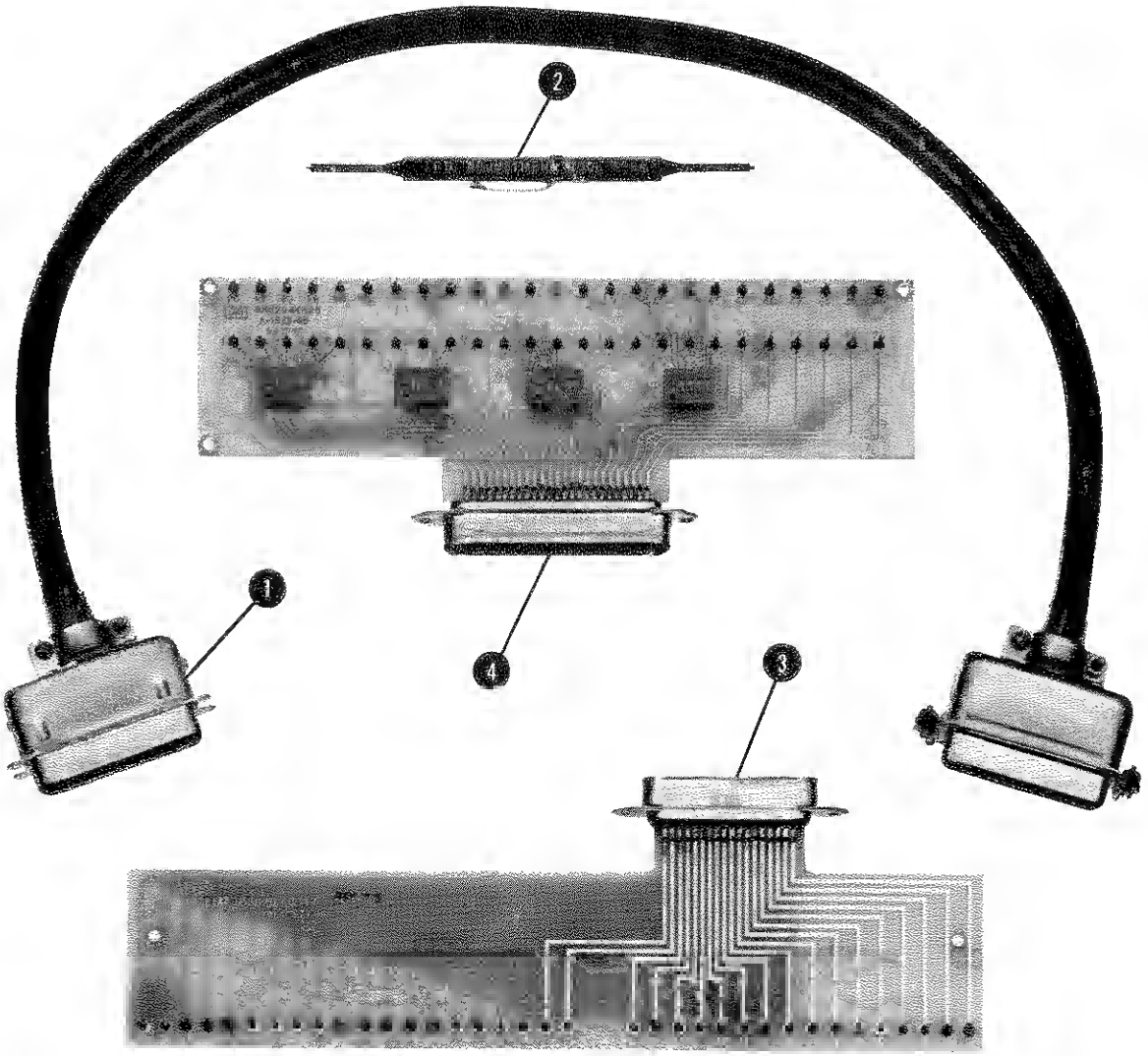
Table 1-4. Recommended Test Equipment (2 of 2)

Instrument	Critical Specifications	Recommended Model	Use*
Air Line (2 required)	20-cm long, APC-7 connectors	HP 11567A	P
Crystal Detector (2 required)	Frequency: 0.01 to 18.6 GHz SWR: < 1.5 to 12.4 GHz < 1.7 to 18.6 GHz Connector: Type N Male	HP 8470B, Option 012	P,A,T
3 dB Attenuator	Attenuation: 3 dB ±0.3 dB Frequency: DC to 18.6 GHz	HP 8491B, Option 003	P,A
10 dB Attenuator	Attenuation: 10 dB ±0.5 dB Frequency: DC to 18.6 GHz	HP 8491B, Option 010	P,A,T
Adjustable Short	Frequency Range: 2.0 to 18.6 GHz	Microlab/FXR SO-6MN	P
Cable	2-ft. long, BNC connectors	HP 11086A	P
Extender Cable ***	(See Figure 1-3.)	HP 08620-60032	A,T
BNC Tee (2 required)	Connectors: BNC jack and plug	HP 1250-0781	P,A
Adjustment Tool***	(See Figure 1-3.)	HP 8830-0024	A
Extender Board	Supplied with instrument (See Figure 1-1.)	HP 86290-60020	A,T
Extender Board	Reversing (See Figure 1-4.)	HP 86290-60033	A

*P = Performance Test; A = Adjustments; T = Troubleshooting

**Thermistor Mount (8478B) and 10-dB Attenuator (8491B, Option 010) are matched for optimum performance to 18.6 GHz. This matched set is an HP 8478B, H-32.

***These parts are included in Service Accessories Package 08620-60124.



Item	Name	Part No.	Use
1	Extender Cable	08620-60032	Moves RF Plug-in outside mainframe for alignment or service.
2	Adjustment Tool	8830-0024	Fits miniature adjustment slot on potentiometers.
3	36-Pin Service Board	08620-60037	Allows probing RF Section interface connector, or rear-panel programming connector on all mainframes except 8620C, during performance testing or troubleshooting of 8620 Series mainframes.
4	50-Pin Service Board	08620-60125	Allows probing rear-panel programming connector during performance testing or troubleshooting of HP Model 8620C Sweep Oscillator mainframe.

Figure 1-3. Service Accessories, HP Part Number 08620-60124

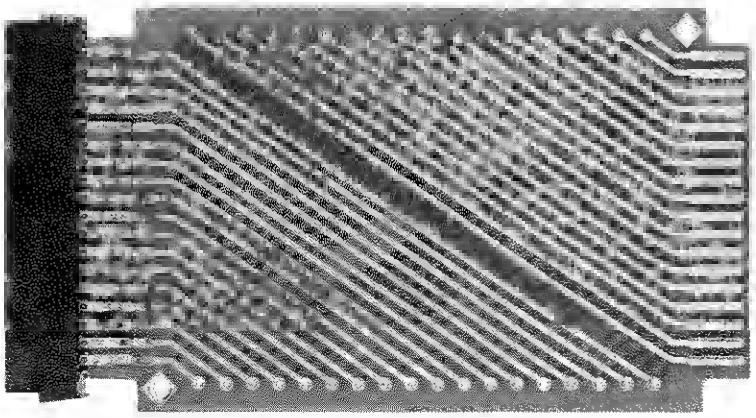
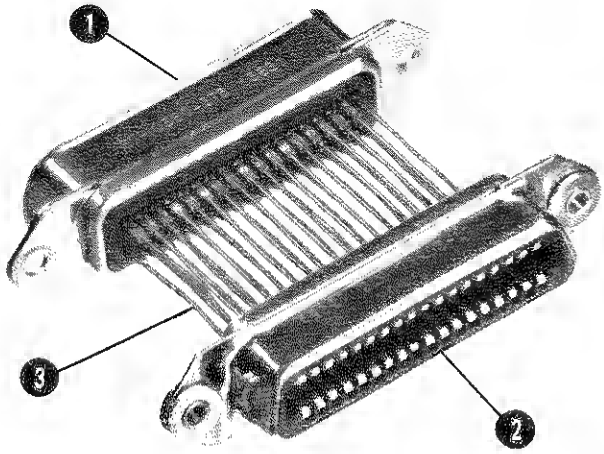


Figure 1-4. Reversing Extender Board, 86290-60033



1. 36-Pin Male Connector (2 x 18) HP Part No. 1251-0483
2. 36-Pin Female Connector (2 x 18) HP Part No. 1251-0484
3. 1-inch 20-Gage Wire HP Part No. 8151-0011

Figure 1-5. RF Section 36-Pin Extender, 08621-60056

SECTION II
INSTALLATION

2-1. INTRODUCTION

2-2. This section provides installation instructions for the Model 86290B RF Plug-in and its accessories. This section also includes information about initial inspection and damage claims, preparation for using the RF Plug-in and packaging, storage and shipment.

2-3. INITIAL INSPECTION

2-4. Inspect the shipping container for damage. If the shipping container or cushioning material is damaged it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked mechanically and electrically. The contents of the shipment should be as shown in Figure 1-1. Procedures for checking electrical performance are given in Section IV. If the instrument combination does not pass the electrical performance tests, refer to the 86290B Adjustments (Section V) in this manual. If, after the 86290B Adjustments have been made, the instrument combination still fails to meet specifications, refer to mainframe Adjustments in the 8620C mainframe manual. If a circuit malfunction is suspected, refer to troubleshooting information in Section VIII of this manual or 8620C mainframe manual. If the instrument does not pass the above electrical tests, or if the shipment contents are incomplete, or if there is mechanical damage or defect, notify the nearest Hewlett-Packard office. If the shipping container is damaged, or the cushioning material shows signs of stress, notify the carrier as well as the Hewlett-Packard office. Keep the shipping materials for carrier's inspection. The HP office will arrange for repair or replacement without waiting for claim settlement.

2-5. PREPARATION FOR USE

2-6. Power Requirements

2-7. When the Model 86290B RF Plug-in is properly installed, it obtains all power through the rear interface connector from the 8620C Sweep Oscillator mainframe.

2-8. Interconnections

2-9. For the Model 86290B RF Plug-in to operate, it must be plugged into an 8620C mainframe. Connection is made by pushing the RF Plug-in into the mainframe so that the plug-in interface connector P1 mates with the mainframe connector.

2-10. Mating Connectors

2-11. All of the externally mounted connectors on the 86290B are listed in Table 2-1. Opposite each 86290B connector is an industry identification, the part number of a mating connector, and the part number of an alternate source for the mating connector.

2-12. Operating Environment

2-13. Temperature. The instument may be operated in temperatures from 0°C to +55°C.

2-14. Humidity. The instrument may be operated in environments with humidity from 5% to 95% at 0° to 40° C. However, the instrument should be protected from temperature extremes which cause condensation within the instrument.

2-15. Altitude. The instrument may be operated at altitudes up to 4572 metres (15000 feet).

2-16. Frequency Scale Installation

2-17. To install frequency scale, proceed as follows:

NOTE

If RF Plug-in is installed in mainframe, it must be removed to install frequency scale. See RF Plug-in removal instructions in Paragraph 2-20.

a. Disengage mainframe front-panel latch handle, shown in Figure 2-1, by pushing downward on handle while pushing inward lightly on top of front panel.

Table 2-1. Model 86290B Mating Connectors

86290B Connector		Mating Connectors	
Connector Name	**Industry Identification**	**Part Number**	**Alternate Source**
J1 RF OUTPUT	TYPE-N	1250-0882	Specialty Connector 25P117-2
J2 ALC EXT INPUT	BNC	1250-0256	Specialty Connector 28 P118-1
J3 SEQ SYNC	BNC	1250-0256	Specialty Connector 28 P118-1
J4 FM	BNC	1250-0256	Specialty Connector 28 P118-1
J5 FREQ REF	BNC	1250-0256	Specialty Connector 28 P118-1
J6 AUX OUT	TYPE-N	1250-0882	Specialty Connector 25P117-2

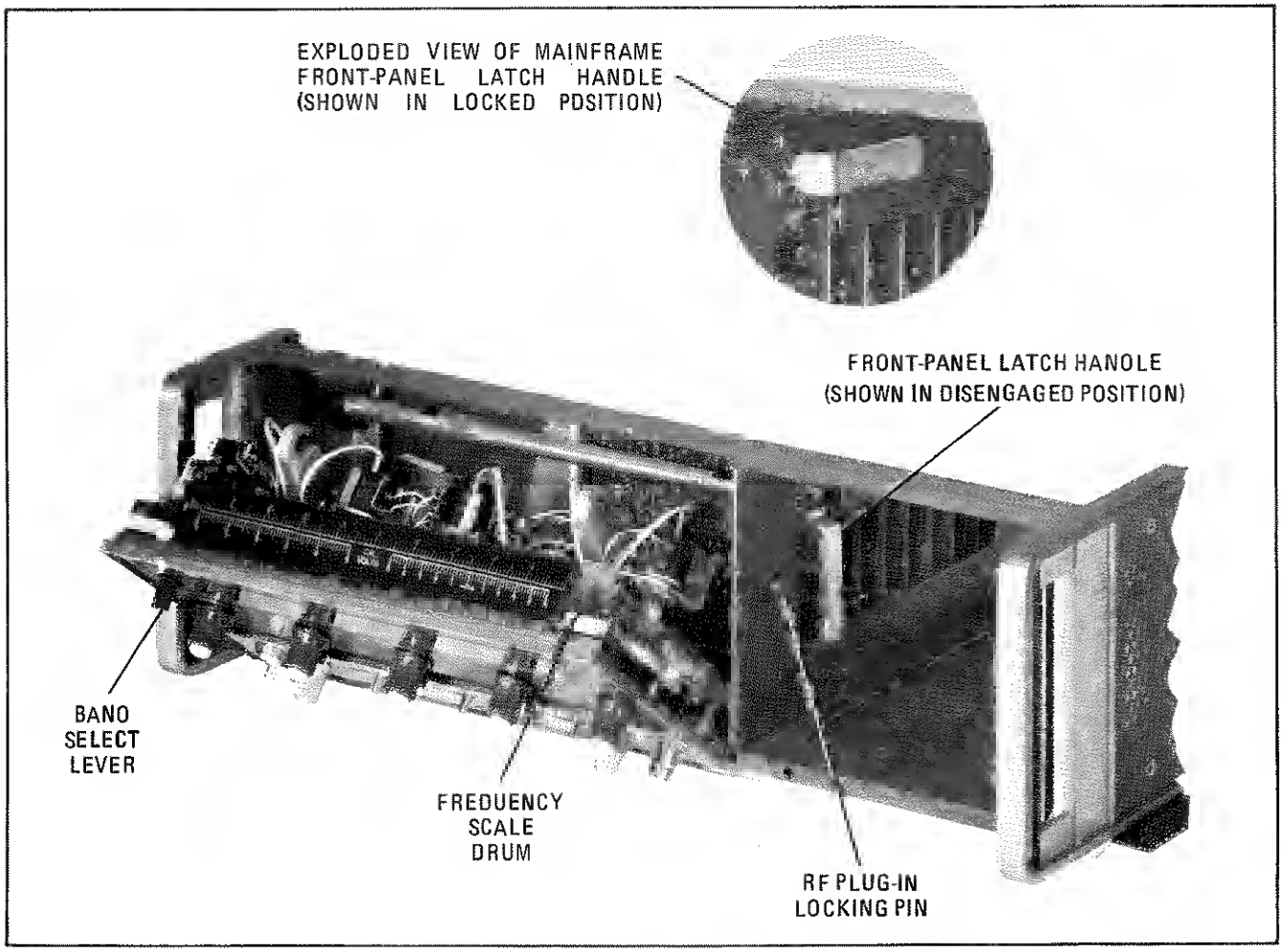


Figure 2-1. Location of Mainframe Parts Pertinent to Frequency Scale and RF Plug-in Installation

b. Swing front panel forward and down to position shown in Figure 2-2.

c. Depress mainframe front-panel BAND select lever, shown in Figure 2-1, to rotate frequency scale drum until desired scale position is accessible.

NOTE

If necessary to remove a frequency scale, exert a pressure OUTWARD, away from drum on right-hand edge of scale.

d. Insert frequency scale so key (a 1/16-inch long, 1/2 inch wide protrusion) on left end of scale fits into notch, shown in Figure 2-2, in roller on left-hand edge of drum.

e. Push inward on right-hand edge of frequency scale to snap it in place in frequency scale drum.

CAUTION

To prevent damage to frequency pointers when bandswitch drum is rotated, make certain that frequency scale is firmly in place and flush with band drum edges.

f. Return front panel to upright (closed) position and, while pushing inward lightly on top of front panel, re-engage front-panel latch handle by pushing it upward to lock position as shown in Figure 2-1, exploded view.

2-18. RF Plug-in Installation and Removal

2-19. Installation. To install RF Plug-in, proceed as follows:

a. If mainframe power is ON, press mainframe LINE switch to OFF position.

b. Position latch handle located on left side of RF Plug-in so it is perpendicular to front panel. Portion of handle with rectangular cut-out should be facing forward and portion with notch should be facing rear of RF Plug-in as shown in Figure 2-3.

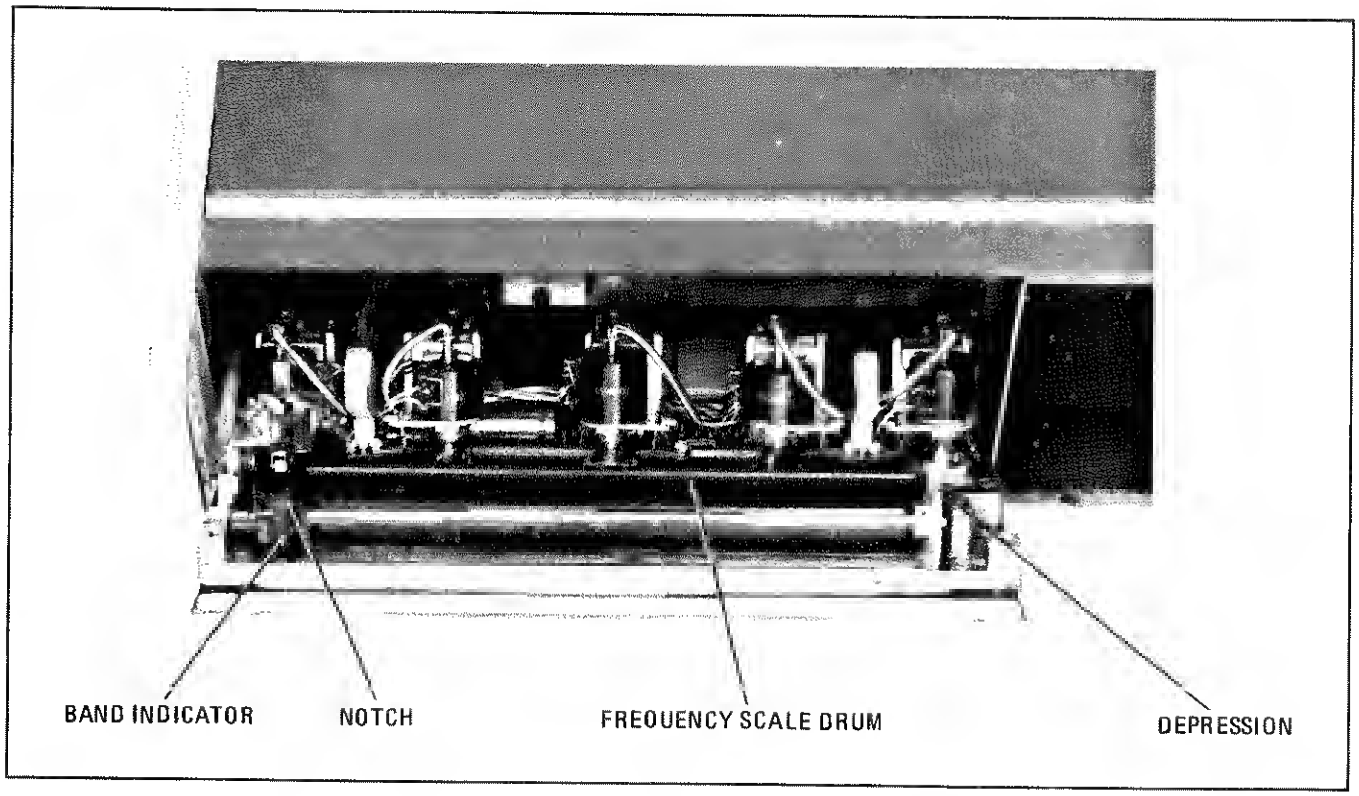


Figure 2-2. Mainframe Front Panel in Open Position

c. Slide RF Plug-in into mainframe towards rear of compartment. RF Plug-in latch handle will engage a locking pin, shown in Figure 2-1, inside mainframe and exposed portion of latch handle will start to move downward.

d. Push latch handle downward, while still pushing inward on RF Plug-in, until latch handle is flush with front panel.

2-20. Removal. To remove RF Plug-in, proceed as follows:

a. Push inward on top of latch handle, shown in Figure 2-3, and pull forward and up on bottom of latch handle.

b. When exposed portion of latch handle is in a position perpendicular to RF Plug-in front panel, it is disengaged from locking pin (Figure 2-1) and RF Plug-in may be removed by pulling forward on latch handle.

2-21. STORAGE AND SHIPMENT

2-22. Environment

2-23. The instrument may be stored or shipped in environments within the following limits:

Temperature	−40°C to +75°C
Humidity	5% to 95% at 0° to 40°C
Altitude	Up to 15240 metres (50000 feet)

The instrument should also be protected from temperature extremes which cause condensation within the instrument.

2-24. Packaging

2-25. Original Packaging. Containers and materials identical to those used in factory packaging are available through Hewlett-Packard offices. If

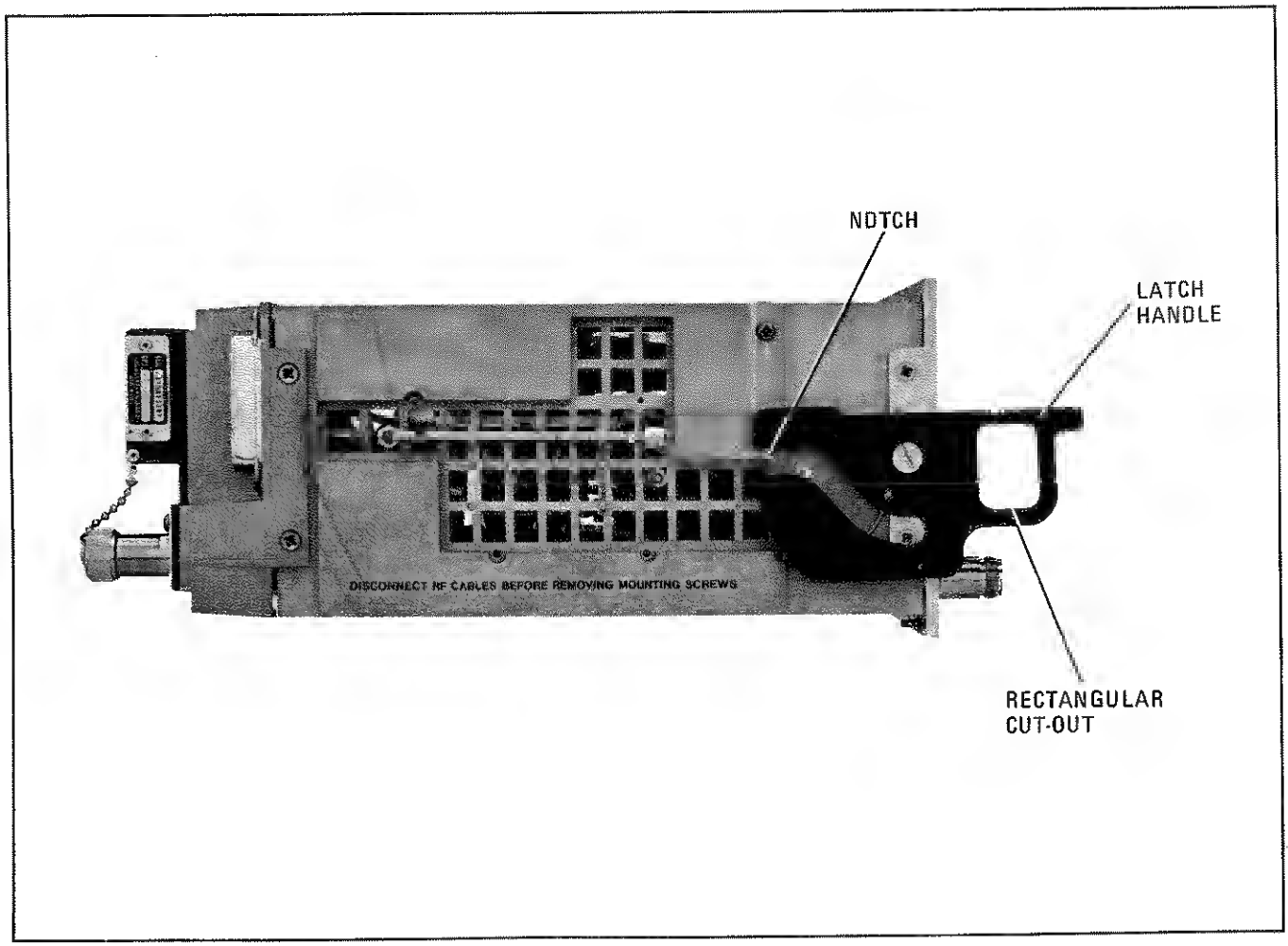


Figure 2-3. RF Plug-In Latch in Release Position

the instrument is being returned to Hewlett-Packard for servicing, attach a tag indicating the type of service required, return address, model number, and full serial number. Also, mark the container FRAGILE to ensure careful handling. In any correspondence, refer to the instrument by model number and full serial number

2-26. Other Packaging. The following general instructions should be used for re-packaging with commercially available materials:

a. Wrap instrument in heavy paper or plastic. (If shipping to Hewlett-Packard Office or Service Center, attach tag indicating type of service required, return address, model number and full serial number.)

b. Use a strong shipping container.

c. Use enough shock-absorbing material around all sides of instrument to provide firm cushion and prevent movement inside container. Protect control panel with cardboard.

d. Seal shipping container securely.

e. Mark shipping container FRAGILE to ensure careful handling.

f. In any correspondence, refer to instrument by model number and full serial number.

SECTION III
OPERATION

3-1. INTRODUCTION

3-2. This operating section explains the function of the controls and indicators of the Model 86290B RF Plug-in. It decribes typical operating modes in a measurement system and covers operator replacement of indicator lamps. Figure 3-12 shows the positions of the ALC Function switch A1S1 that the operator sets for each application.

3-3. PANEL FEATURES

3-4. Front and rear panel features are described in Figures 3-2 and 3-3. Description numbers match the numbers on the illustration.

3-5. OPERATOR'S CHECKS

3-6. The Operator's Checks (Figure 3-4) allow the operator to make quick evaluation of the instrument's main functions prior to use. These checks assume that the 86290B RF Plug-in is installed in an 8620C Sweep Oscillator mainframe. The checks cover the RF Plug-in and mainframe; therefore, if the correct indications are not obtained, trouble may be in either of the units. If the RF Plug-in is suspected, perform applicable performance tests in Section IV of this manual, and if necessary, the related adjustments in Section V. If correct indications are still not obtained, refer to the troubleshooting information in Section VIII to isolate the problem.

3-7. OPERATING INSTRUCTIONS

WARNING

Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting the protective earth terminal could make this instrument dangerous.

NOTE

Instrument may not meet maximum leveled power specifications when UNLEVELED lamp is lit.

3-8. Internal Leveling

3-9. The most convenient method of RF output leveling is internal leveling. A portion of the RF output is coupled from a Directional Coupler DC1 to a Detector CR1. A proportional dc-voltage is applied to an operational amplifier in the 86290B ALC Amplifier Assembly A1. The Operator's Checks in Figure 3-4 are performed in the internal leveling mode.

3-10. External Power Meter Leveling

3-11. Power leveling can be obtained with a power meter and power splitter or directional coupler as shown in Figure 3-10. A sample of the RF output signal is routed to a power meter to produce a dc voltage proportional to the RF signal level. The dc voltage is applied to the 86290B ALC circuits and compared with an internal reference voltage. A difference voltage is produced and amplified by the ALC amplifier before being applied, as modulator drive, to the Coupler/Modulator assembly A10. The modulator drive controls the output of the Coupler/Modulator to maintain a constant power level.

3-12. External Crystal Detector Leveling

3-13. Power may be leveled externally using a power splitter (or directional coupler) and crystal detector. This leveling system uses a power splitter to sample the RF output signal and a crystal detector to produce a dc voltage proportional to RF signal level. The detector voltage is compared with an internal reference voltage, and the difference voltage changes the output power level to keep it constant at the output. Instead of a power splitter, a directional coupler may be used to sample the RF signal for the leveling loop. Directional couplers are usually narrow band, whereas the power splitter is flat over a wide frequency range. The advantage of a directional coupler is that it does not have a 6-dB loss like the power splitter, therefore a

higher maximum leveled power output may be obtained. To place the crystal detector leveling loop in operation, use the test setup and procedures in Figure 3-11.

3-14. Internal AM

3-15. The 8620C Sweep Oscillator mainframe has an internal 1 kHz square wave for internal amplitude modulation of the RF signal. This provides an ON/OFF ratio of <25 dB for all bands of the 86290B.

3-16. External AM

3-17. The 86290B RF Output (CW) signal can be amplitude modulated from 0 to 100% using an external modulating signal applied to the mainframe EXT AM connector. This provides an ON/OFF ratio of >30 dB for all bands of the 86290B. A positive 5 volts input reduces the RF power output to at least 30 dB below specified maximum power.

3-18. External FM

3-19. The 86290B RF Output signal can be frequency modulated using an external modulating signal applied to the 86290B FM Input connector. The external FM function provides a means of obtaining an output frequency that varies under the control of an external modulation signal. A positive going voltage causes output frequency to decrease while a negative going voltage causes output frequency to increase.

3-20. Frequency Reference

3-21. A sweep signal output is available at the rear-panel FREQ REF connector J5 for phase-locking external equipment. The sweep signal is approximately +1V/GHz.

3-22. Phase-Lock Operation

3-23. The 86290B RF Output (CW) signal may be phase-locked using an external phase-lock signal applied to the 86290B FM Input connector. The phase-lock function provides a means of obtaining a very stable CW frequency by transferring the frequency stability of the reference oscillator to the source. If the CW frequency starts to drift, the phase difference between the CW frequency and the reference frequency (reference oscillator) is detected, producing a dc voltage. The dc voltage is a correction signal which restores the CW frequency to its previous point. Stability of this CW frequency is determined by the stability of the reference oscillator.

3-24. X-Y Recorder Operation

3-25. In Sequential Sweep operation (Band 4), the power output of the 86290B goes to zero at each switchpoint for a brief time interval. This is approximately 6 ms between Band 1 and 2 and approximately 8 ms between Bands 2 and 3. (See Section VIII for a complete explanation of Sequential Sweep operation.)

3-26. When an X-Y Recorder is used to plot the detected RF amplitude from the 86290B, the recorder's frequency response is not adequate to respond fully to this "zero-power" interval and will indicate a small negative going spike only. The width of this spike is a function of sweep speed, and is essentially zero for sweep times greater than 20 seconds.

3-27. Recorders without DELAY MUTE capability will display the "zero-power" spikes at each switchpoint and is unavoidable. However, information loss caused by the spikes can be eliminated by using a slow enough sweep time (<20 sec). Recorders with DELAY MUTE capability can be operated so that "zero-power" spikes are eliminated. This is accomplished by connecting the 86290B SEQ SYNC rear-panel output to the X-Y Recorder DELAY MUTE input. Using this DELAY MUTE feature will give a "glitch" free plot for test devices that have relatively flat responses at the switch point frequencies. However, test devices having a rapid rate of change across a switch point, such as the Band Pass filter illustrated in Figure 3-1, may still show a slight "glitch." Since it may not be immediately apparent that the "glitch" is caused by the test setup rather than the device under test, it is recommended that a reference plot be made using the X-Y Recorder PEN LIFT input whenever "glitches" appear in the test device output near the 6.2 GHz and 12.4 GHz switch-point frequencies. The PEN LIFT Input will not affect the switch-points, therefore the source of the "glitch" can be easily recognized. This is illustrated in Figure 3-1.

3-28. Retrace time of the 8620C mainframe, when using an 86290B is much faster than sweep time. When RF Blanking is used, 86290B power output goes to zero during retrace. If an X-Y Recorder is connected, the recorder pen will not be able to go to "zero-power" as rapidly as the 86290B. Therefore, the retrace line on the X-Y Recorder will not resemble actual RF response. This can be improved by placing the mainframe rear-panel RF BLANKING/OFF switch in the

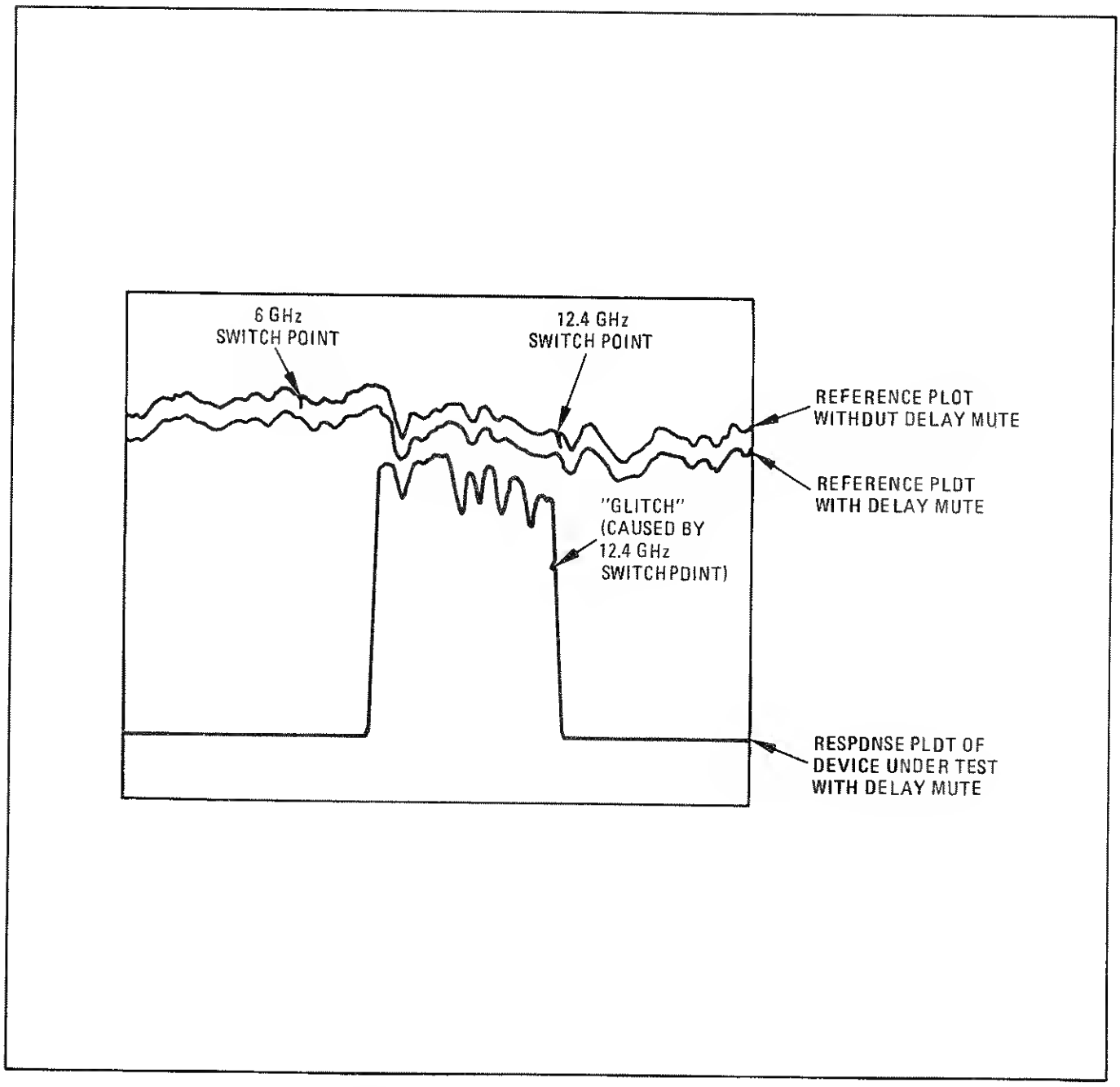


Figure 3-1. Typical Recorder Plot of Device Under Test and Reference Plots

OFF position. If a "zero-power" reference line is desired, one may be drawn by triggering a single sweep with 86290B power off (front-panel RF ON-OFF switch OFF).

3-29. X-Y RECORDER MODIFICATION KIT

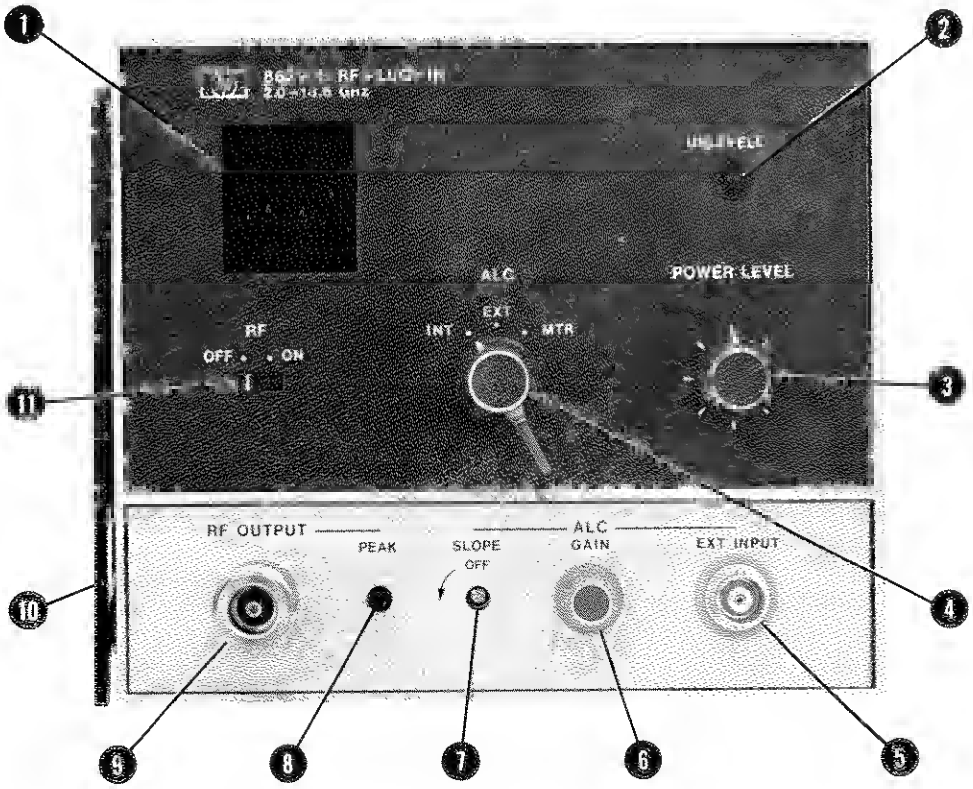
3-30. A modification kit is available to convert older X-Y Recorders to obtain DELAY MUTE capability. See the X-Y Recorder Operating and Service Manual or contact your nearest Hewlett-Packard Office for part number information. Addresses of HP Offices are provided at the rear of this manual.

3-31. OPERATOR'S MAINTENANCE

3-32. Operator maintenance on the 86290B consists of replacing defective front panel Band indicator lamps. Removal and replacement procedures are contained in Figure 3-13.

3-33. Replacement of the UNLEVELED lamp is shown in Section VIII as a maintenance procedure. (See Figure 8-2.)

FRONT PANEL FEATURES



1 Frequency/Band Display indicators A8DS1 — A8DS4:

2.0 — 6.2 GHz. Illuminates with Band 1 selected on mainframe.

6.0 — 12.4 GHz. Illuminates with Band 2 selected on mainframe.

12.0 — 18.6 GHz. Illuminates with Band 3 selected on mainframe.

2.0 — 18.6 GHz. Illuminates with Band 4 selected on mainframe. Band 4 is the Sequential sweep.

2 UNLEVELED lamp DS1. Lights if output power is unlevel across selected frequency range.

3 POWER LEVEL control R1. Adjusts RF output power. Clockwise rotation increases output power.

4 ALC switch S2. Selects INT (internal), EXT (external), or MTR (power meter) power leveling modes.

Figure 3-2. Front Panel Controls, Connectors and Indicators (1 of 4)

FRONT PANEL FEATURES

5 ALC EXT INPUT BNC connector J2. Input for external leveling from power meter or crystal detector.

6 ALC GAIN control R4. Adjusts ALC leveling amplifier gain when system is using an external leveling loop. Clockwise rotation increases ALC loop gain.

7 ALC SLOPE-OFF control R3. Compensates for high frequency power losses in external RF cables by attenuating power at lower frequencies. This compensation provides a flat RF signal output. The OFF Position removes all compensation.

8 RF OUTPUT PEAK control R2. Optimizes RF output power for selected frequency range and assures minimum harmonically related signals.

9 RF OUTPUT connector J1. Type-N 50-ohm RF output connector (APC-7 for Option 005).

CAUTION

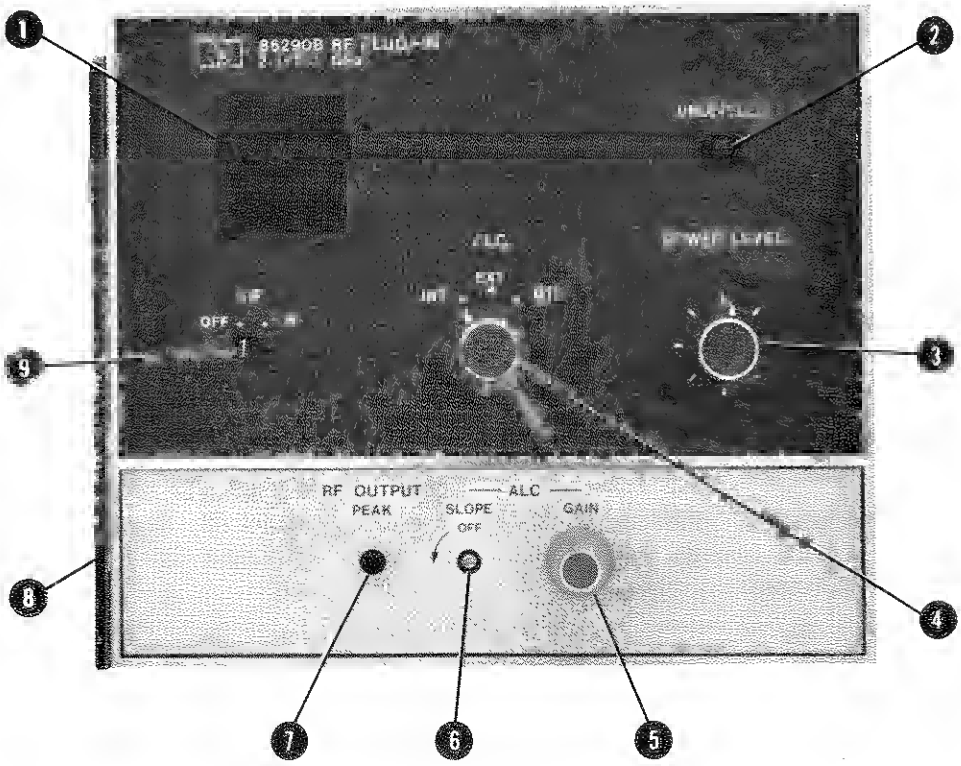
Do not apply any DC voltage to the RF OUTPUT connector or damage to the instrument may occur.

10 Drawer Latching Handle. Aids in installing and removing RF Plug-in. After installation, handle locks to hold RF Plug-in in place.

11 RF ON-OFF switch S1. Turns RF power on and off. This is useful when zeroing a power meter or establishing a zero power reference on an X-Y recorder.

Figure 3-2. Front Panel Controls, Connectors and Indicators (2 of 4)

FRONT PANEL FEATURES
OPTION 004



1 Frequency/Band Display indicators A8DS1—A8DS4:

2.0 — 6.2 GHz. Illuminates with Band 1 selected on mainframe.

6.0 — 12.4 GHz. Illuminates with Band 2 selected on mainframe.

12.0 — 18.6 GHz. Illuminates with Band 3 selected on mainframe.

2.0 — 18.6 GHz. Illuminates with Band 4 selected on mainframe. Band 4 is the Sequential Sweep.

2 UNLEVELED lamp DS1. Lights if output power is unlevel across selected frequency range or if automatic leveling is not used.

3 POWER LEVEL control R1. Adjusts RF output power. Clockwise rotation increases output power.

4 ALC switch S2. Selects INT (internal), EXT (external), or MTR (power meter) power leveling modes.

5 ALC GAIN control R4. Adjusts ALC leveling amplifier gain when system is using an external leveling loop. Clockwise rotation increases ALC loop gain.

6 ALC SLOPE-OFF control R3. Compensates for high frequency power losses in external RF cables by attenuating power at lower frequencies. This compensation provides a leveled RF signal output. The OFF position removes all compensation.

Figure 3-2. Front Panel Controls, Connectors and Indicators (3 of 4). Option 004

FRONT PANEL FEATURES
OPTION 004

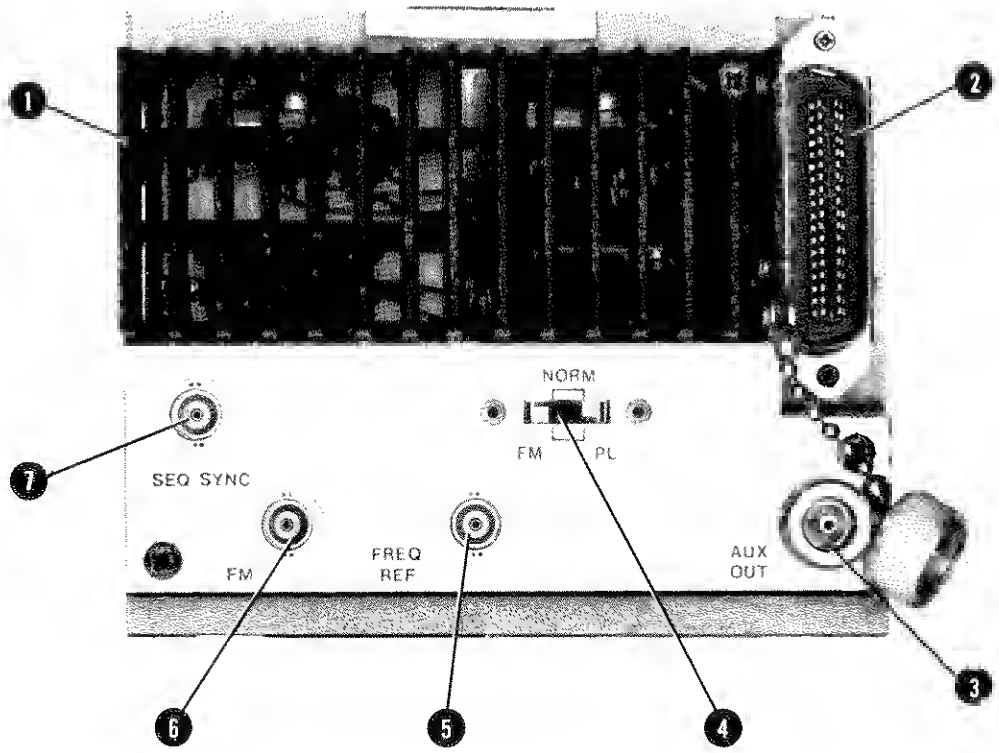
7 **RF OUTPUT PEAK control R2.** Optimizes RF output power for selected frequency range and assures minimum harmonically related signals.

8 **Drawer Latching Handle.** Aids in installing and removing RF Plug-in. After installing, handle locks to hold RF Plug-in in place.

9 **RF ON-OFF switch S1.** Turns RF power on and off. This is useful when zeroing a power meter or establishing a zero power reference on an X-Y recorder.

Figure 3-2. Front Panel Controls, Connectors and Indicators (4 of 4), Option 004

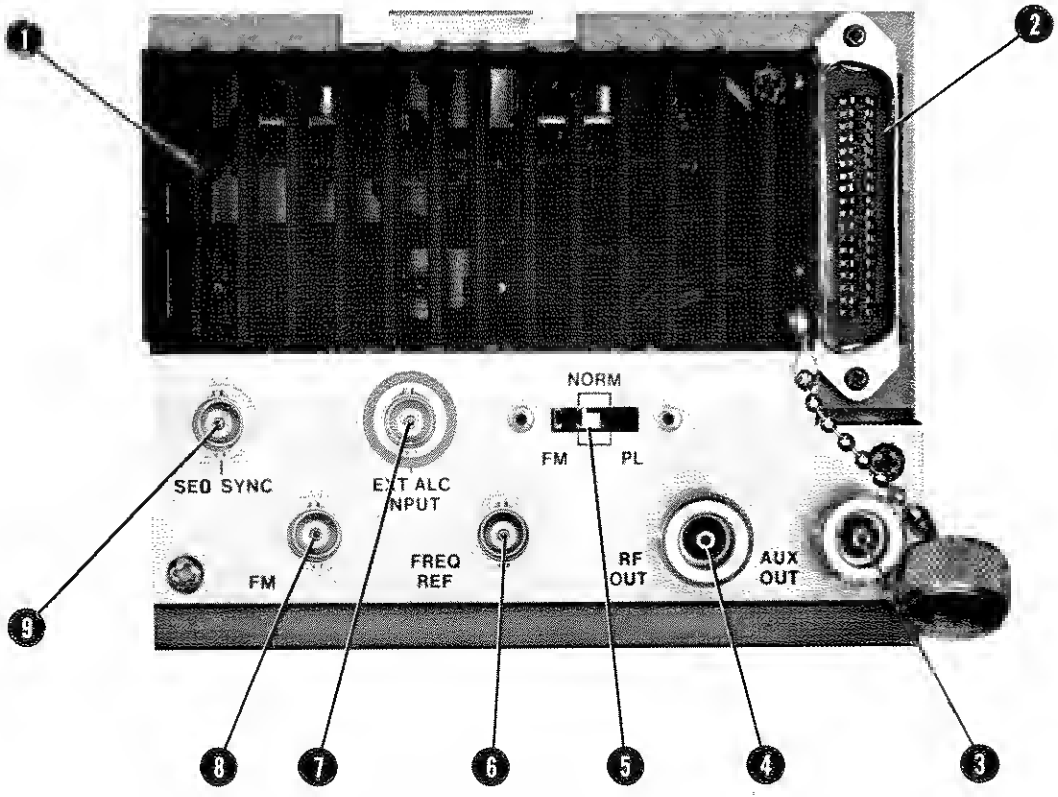
REAR PANEL FEATURES



1. **Rear Panel Heatsink.** Provides heat dissipation and mounting for YTM and YTO coil-driver transistors Q1 and Q2, and reference resistors R5 and R6.
2. **Interface Connector P1.** Provides interconnection between 8620C mainframe and 86290B RF Plug-in.
3. **AUX OUT J6.** Provides YIG-tuned Oscillator RF output signal of 2.0 — 6.2 GHz. (Cover provided should be installed when AUX OUT not used.)
4. **FM-NORM-PL switch S3.** Operates in conjunction with FM input connector to provide optimum performance for either normal sweep (NORM), frequency modulation (FM), or phase-lock (PL) operation. If FM or PL modes of operation are not being used, switch should be in NORM.
5. **FREQ REF BNC connector J5.** Provides approximately +1 volt/GHz ramp signal output.
6. **FM BNC connector J4.** Input connector for FM modulation signal or phase-locking error signal.
7. **SEQ SYNC connector J3.** Provides RF blanking output for timing signal to external equipment.

Figure 3-3. Rear Panel Connectors and Switch (1 of 2)

REAR PANEL FEATURES
OPTION 004



1. **Rear Panel Heatsink.** Provides heat dissipation and mounting for YTM and YTO coil-driver transistors Q1 and Q2, and reference resistors R5 and R6.

2. **Interface Connector P1.** Provides interconnection between 8620C mainframe and 86290B RF Plug-in.

3. **AUX OUT J6.** Provides YIG-tuned Oscillator RF output signal of 2.0 – 6.2 GHz.

4. **RF OUT connector J9.** Type-N 50-ohm RF output connector. (APC-7 for Option 005).

CAUTION

Do not apply any DC voltage to the RF OUTPUT connector or damage to the instrument may occur.

5. **FM-NORM-PL switch S3.** Operates in conjunction with FM input connector to provide optimum performance for either normal sweep (NORM), frequency modulation (FM), or phase lock (PL) operation. If FM or PL modes of operation are not being used, switch should be in NORM.

6. **FREQ REF BNC connector J5.** Provides approximately +1 volt/GHz ramp signal output.

7. **EXT ALC INPUT BNC connector J10.** Input for external leveling from power meter or crystal detector.

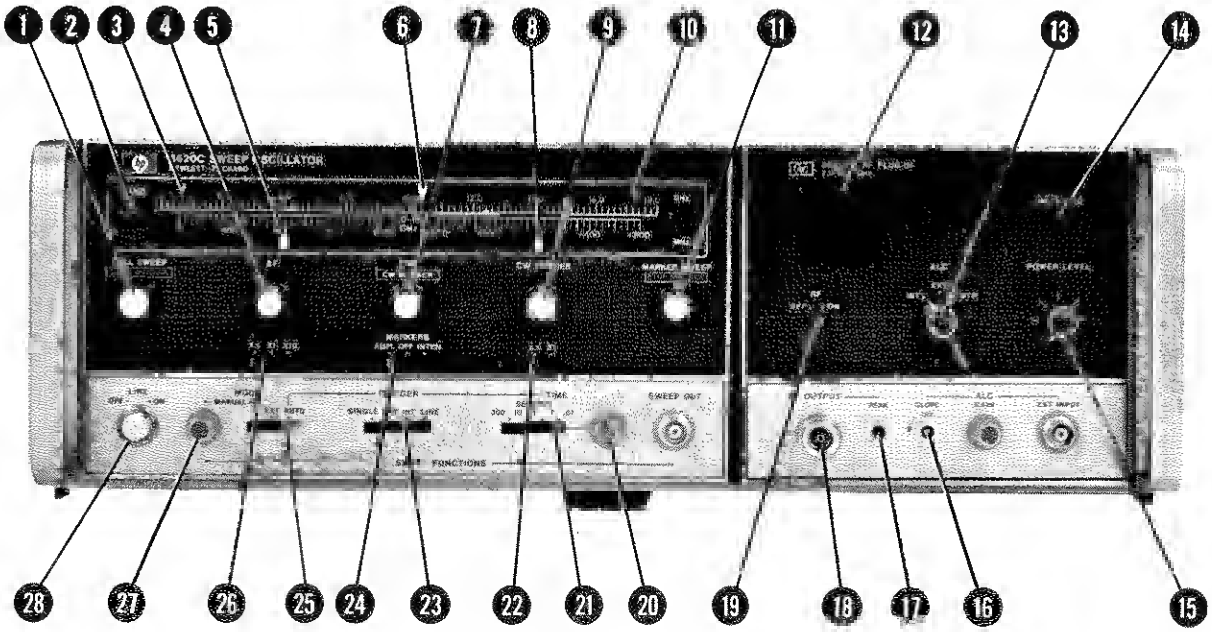
8. **FM BNC connector J4.** Input connector for FM modulation signal or phase locking error signal.

9. **SEQ SYNC connector J3.** Provides RF blanking output for timing signal to external equipment.

Figure 3-3. Rear Panel Connectors and Switch (2 of 2), Option 004

OPERATOR'S CHECKS

FRONT



REAR

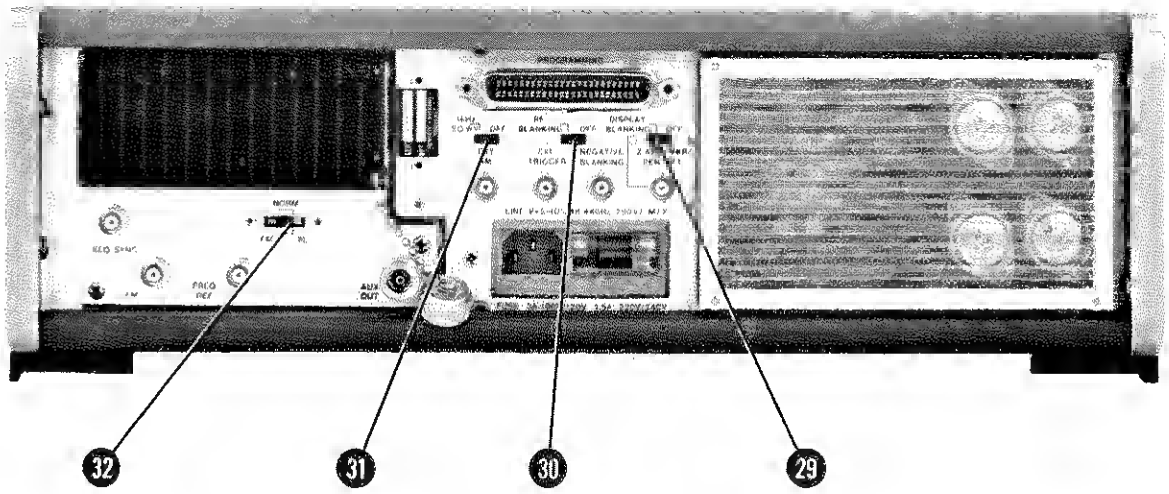
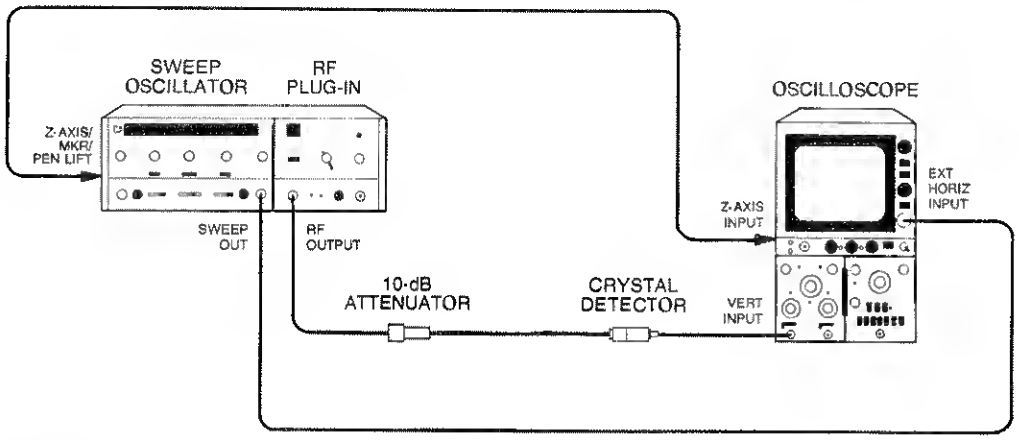


Figure 3-4. Operator's Checks (1 of 4)

OPERATOR'S CHECKS



EQUIPMENT:

Sweep Oscillator	HP 8620C
RF Plug-in	HP 86290B
Oscilloscope	HP 182C/1801A/1820C
Crystal Detector	HP 8470B, Option 012
10-dB Attenuator	HP 8491B, Option 010

CAUTION

Do not apply any DC voltage to the RF OUTPUT connector or damage to the instrument may occur.

NOTE

All procedures are written using the 8620C Sweep Oscillator. The 86290B will not operate with an 8620A or 8620B mainframe.

PROCEDURE:

1. Connect equipment as shown in test setup.

2. Set controls as follows:

8620C:

BAND (2)	BAND 4, 2.0 — 18.6 GHz
MARKERS (24)	INTEN
MODE (25)	INT
TIME-SECONDS (21)	.1 — .01
TIME-SECONDS Vernier (20)	Clockwise
I kHz SQ WV/OFF (rear panel) (31)	OFF
DISPLAY BLANKING/OFF (rear panel)	(29) DISPLAY BLANKING
RF BLANKING/OFF (rear panel) (30)	OFF

Figure 3-4. Operator's Checks (2 of 4)

OPERATOR'S CHECKS

86290B:

RF OUTPUT (18) (19) ..... ON
POWER LEVEL (15) ..... Fully clockwise
ALC (13) ..... INT
SLOPE-OFF (16) ..... OFF
FM-NORM-PL (rear panel) (32) ..... NORM (Normal)

3. Press LINE pushbutton switch (28) to ON; LINE (28), and FULL SWEEP (1) pushbuttons should light. The 2.0 – 18.6 GHz lamp (12) should light on 86290B.

4. Check that the instrument is sweeping correctly. This is indicated by a continuous signal-level line below zero-volt dc level on oscilloscope. Adjust PEAK control (17) for maximum signal on oscilloscope.

5. UNLEVELED lamp (14) may be lit. If UNLEVELED lamp is lit, reduce output power by turning 86290B POWER LEVEL control (15) counterclockwise until UNLEVELED lamp goes out. This is adjustment point for maximum leveled power. Oscilloscope trace should be leveled. (Refer to Figures 3-5 and 3-6 for typical oscilloscope display of Sequential Sweep unleveled and leveled RF Power Output. Refer to Figures 3-7 and 3-8 for single-band displays.)

6. Set 8620C MARKERS switch (24) to INTEN position. Markers should appear on oscilloscope trace as bright dots. Adjust oscilloscope intensity for best contrast. Set MARKERS switch to AMPL position. Markers should appear on oscilloscope trace as pips.

7. Set 8620C MODE switch (25) to MANUAL position and slowly adjust MANUAL control (27). Trace dot should move across oscilloscope. Return 8620C MODE switch to AUTO.

8. Press 8620C CW pushbutton (7); pushbutton should light and trace on oscilloscope should be a dot. Change frequency (7) with CW MARKER control. Dot should move across oscilloscope.

Figure 3-4. Operator's Checks (3 of 4)

OPERATOR'S CHECKS

9. Press 8620C CW VERNIER pushbutton switch (9) ; pushbutton should light. Adjust CW VERNIER control. White pointer (8) above CW VERNIER control should move. Dot on oscilloscope should also move across CRT at a very slow rate and through a narrow range. CW VERNIER slide switch (22) selects a 0.1 multiplier (X.1 position) for CW vernier scale; in X1 position, scale is read directly. Press 8620C CW pushbutton; CW VERNIER Pushbutton lamp should turn off.

10. Press 8620C ΔF pushbutton (4) ; ΔF and CW (7) pushbuttons should be lit. Deviation from CW frequency is selected by ΔF control, and adjusting it moves white pointer (5) above ΔF control. ΔF slide switch (26) selects a 0.1 multiplier (X.1 position), a 1.0 multiplier (X1 position), or a 10 multiplier (X10 position).

11. Adjust POWER LEVEL control (15) fully clockwise. Adjust 8620C ΔF control (4) between zero and maximum. Sweep trace should be displayed on oscilloscope and should change as ΔF control is adjusted.

Figure 3-4. Operator's Checks (4 of 4)

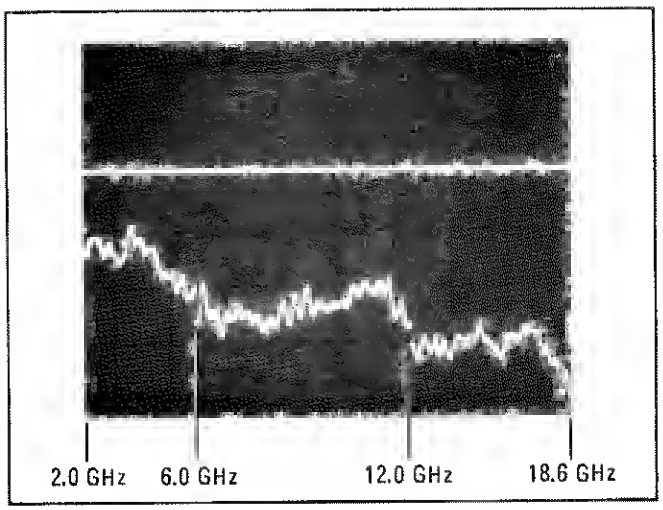


Figure 3-5. Unleveled RF Power Output for Sequential Sweep

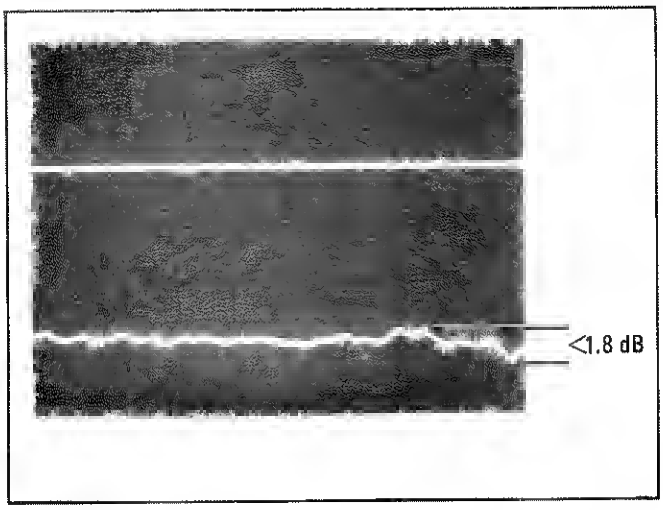


Figure 3-6. Leveled RF Power Output for Sequential Sweep

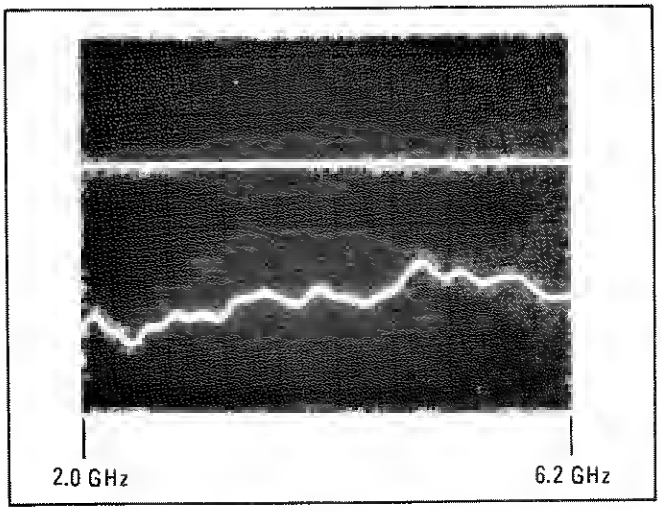


Figure 3-7. Unleveled RF Power Output for Single Band (Band 1)

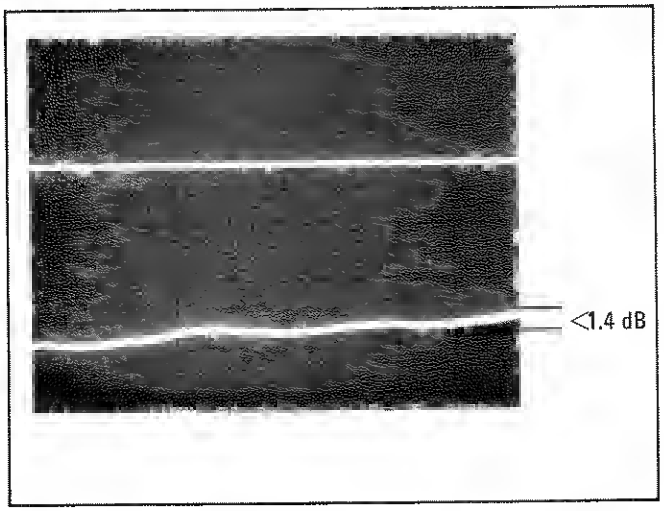


Figure 3-8. Leveled RF Power Output for Single Band (Band 1)

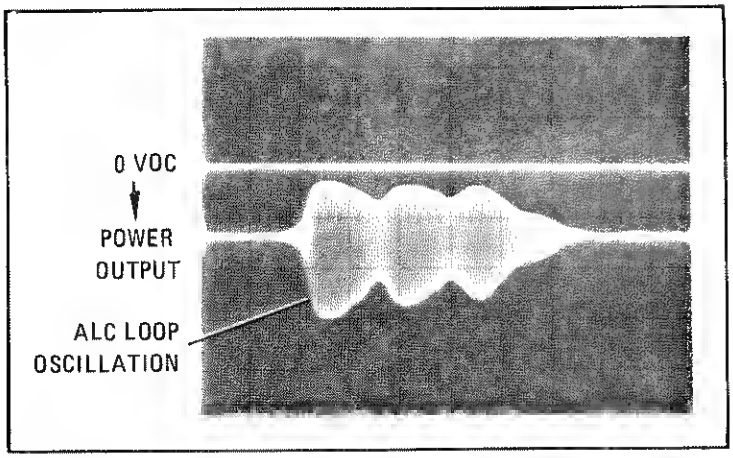
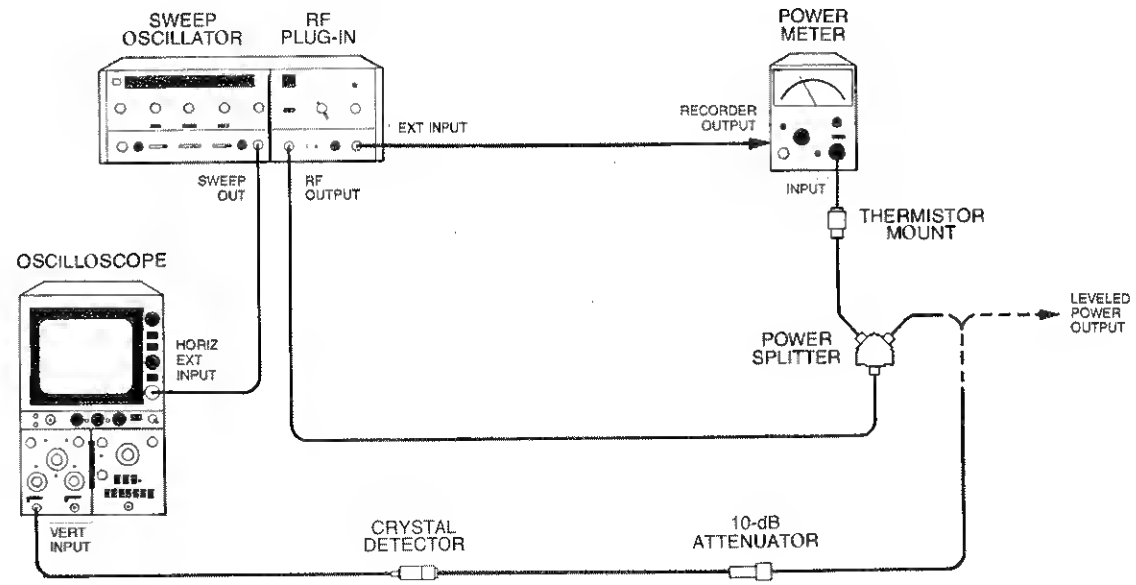


Figure 3-9. Oscillations Due to Excessive ALC Loop Gain

EXTERNAL POWER METER LEVELING



EQUIPMENT:

Sweep Oscillator	HP 8620C
RF Plug-in	HP 86290B
Oscilloscope	HP 182C/1801A/1820C
Power Meter	HP 432A
Thermistor Mount	HP 8478B
Crystal Detector	HP 8470B, Option 012
10-dB Attenuator	HP 8491B, Option 010
Power Splitter	HP 11667A

CAUTION

Do not apply any DC voltage to the RF OUTPUT connector or damage to the instrument may occur.

NOTE

Power meter leveling should be used at slowest sweep rates. Leveling is limited by response time of thermistor mount

PROCEDURE:

1. Connect equipment as shown in test setup.

Figure 3-10. External Power Meter Leveling (1 of 2)

EXTERNAL POWER METER LEVELING

2. Set controls as follows:

8620C:

BAND	BAND 4, 2.0 – 18.6 GHz
MARKERS	OFF
MODE	AUTO
TRIGGER	INT
TIME-SECONDS	100 – 10
TIME-SECONDS Vernier	Fully clockwise
1 kHz SQ WAVE/OFF (rear panel)	OFF
DISPLAY BLANKING/OFF (rear panel)	DISPLAY BLANKING

86290B:

RF OUTPUT	ON
POWER LEVEL	Fully clockwise
ALC	MTR (Power Meter)
ALC-GAIN	Fully counterclockwise
FM-NORM-PL (rear panel)	NORM (Normal)

3. Press 8620C LINE pushbutton to ON; LINE and FULL SWEEP pushbuttons should light, indicating FULL SWEEP sweep mode is selected. The 2.0 — 18.6 GHz lamp should light on 86290B.

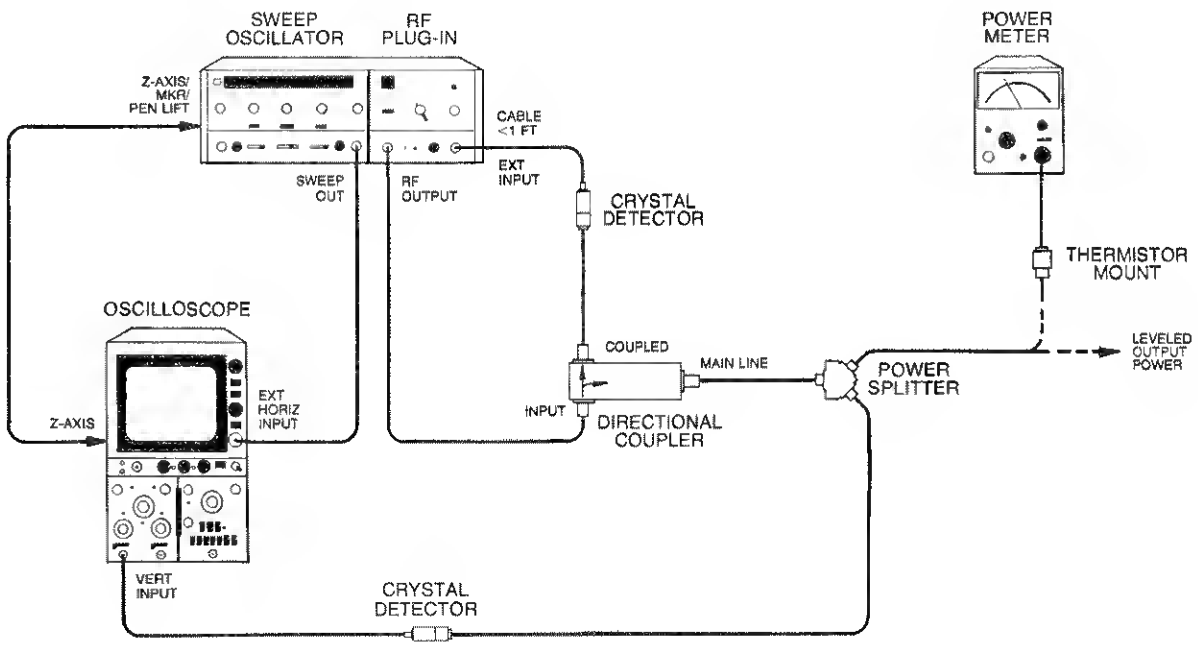
4. Select range on power meter to obtain indication near top 1/3 of meter scale.

5. Adjust 86290B ALC GAIN control clockwise until leveling across band occurs as shown in Figure 3-6. If trace is not leveled or is only partially leveled (as shown in Figure 3-5) with ALC GAIN fully clockwise, reduce RF OUTPUT power. This is done by adjusting POWER LEVEL control counterclockwise until leveling occurs as shown in Figure 3-6. If oscillations appear on trace as shown in Figure 3-9, turn ALC GAIN control counterclockwise. With proper leveling across the band, the 86290B UNLEVELED light should be out.

6. To use leveled RF Power output for testing external equipment, make connection at point marked "Leveled Power Output."

Figure 3-10. External Power Meter Leveling (2 of 2)

EXTERNAL CRYSTAL DETECTOR LEVELING



NOTE

Cables in the ALC loop must be kept <1 foot in length for best ALC response.

EQUIPMENT:

Sweep Oscillator	HP 8620C
RF Plug-in	HP 86290B
Oscilloscope	HP 182C/1801A/1820C
Power Meter	HP 432A
Crystal Detector (2 required)	HP 8470B, Option 012
Power Splitter	HP 11667A
Directional Coupler	HP 11691D, Option CO-2
Thermistor Mount	HP 8478B

PROCEDURE:

1. Connect equipment as shown in test setup.

CAUTION

Do not apply any DC voltage to the RF OUTPUT connector or damage to the instrument may occur.

NOTE

Crystal Detector output should be between 50 mVdc and 750 mVdc.

Figure 3-11. External Crystal Detector Leveling (1 of 2)

EXTERNAL CRYSTAL DETECTOR LEVELING

2. Set controls as follows:

8620C:

BAND ..... BAND 4, 2.0 — 18.6 GHz
MARKER ..... OFF
MODE ..... AUTO
TRIGGER ..... INT
TIME/SECONDS Vernier ..... Fully clockwise
1 kHz SQ WAVE/OFF (rear panel) ..... OFF
DISPLAY BLANKING/OFF (rear panel) . .DISPLAY BLANKING

86290B:

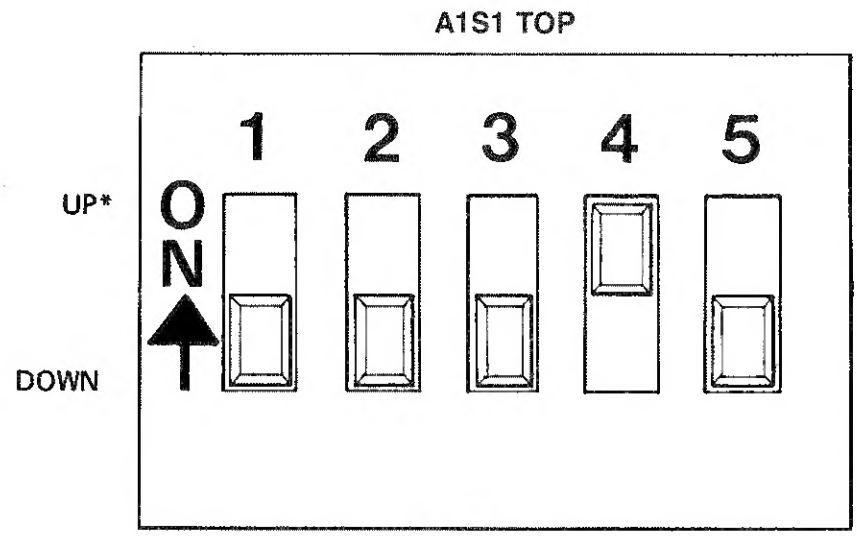
RF OUTPUT ..... ON
POWER LEVEL ..... Fully clockwise
ALC ..... EXT
ALC GAIN ..... Fully clockwise
FM-NORM-PL (rear panel) ..... NORM (Normal)

3. Press 8620C LINE pushbutton to ON; LINE, and FULL SWEEP pushbuttons should light, indicating FULL SWEEP mode is selected. The 2. — 18.6 GHz lamp should light on 86290B.

4. Adjust ALC GAIN and POWER LEVEL controls fully clockwise for maximum RF power OUTPUT and maximum ALC Loop gain. Adjust PEAK control for maximum RF power. One of the conditions shown in Figures 3-5 through 3-9 should be displayed on oscilloscope. If trace is unleveled as shown in Figures 3-5 or 3-7 (or partially leveled) and UNLEVELED lamp is on, turn POWER LEVEL control counterclockwise until trace is level. (See Figures 3-6 and 3-8). If ALC loop gain is too high, oscillations may occur as shown in Figure 3-9. To remove oscillations, reduce ALC loop gain by turning ALC GAIN control counterclockwise.

5. To use leveled RF power output for testing external equipment, make connection at point marked "Leveled Output Power."

Figure 3-11. External Crystal Detector Leveling (2 of 2)



POSITIONS*	FUNCTIONS	
1 and 2	Spares.	
3 UP	Upper Clamp Removed (See Note 2 below).	
DOWN	Upper Clamp In (INT operation only)	
4 UP	Square Wave Modulation ON	Non linear modulation mode
DOWN	No Modulation	
5 UP	Sine Wave Modulation ON	Linear modulation mode
DOWN	No Modulation	

NOTE 1

Only one Modulation Mode should be UP (ON) at a time.

NOTE 2

In INTernal mode and when position 3 is DOWN, the 86290B output power is clamped typically at +13 dBm by the Upper Power Clamp on the A1 ALC Assembly.

*On some switches, the UP position is marked ON, on others, the DOWN position is marked with a dot.

Figure 3-12. Switch Positions and Functions for ALC Function Switch A1S1

BAND INDICATOR LAMP REPLACEMENT

1. Press mainframe LINE switch to OFF positon.
2. Remove 86290B RF Plug-In from mainframe.
3. Remove front panel:

NOTE

If instrument has Option 004 (rear-panel RF OUT) installed, proceed to step b.

a. Disconnect cable W10 from RF OUTPUT connector J1.

b. Remove Drawer Latch Handle (5) by removing screw (3) and latch spring (2). Note position of spring (2) and location of hole (1) for reinstalling.

c. Remove four screws (4) from front panel (two on each side).

d. Pull front panel out of frame slightly and remove connector J7 from A7 Master Board.

4. Remove and replace lamp:

a. Lift contact spring (6) slightly and rotate it to expose base of lamp, (A8DS1-A8DS4). Remove old lamp.

NOTE

Lifting the contact spring too far may bend it, reducing spring tension.

b. Install new lamp and replace contact spring (6) over base.

5. Install front panel by reversing instructions in step 3.

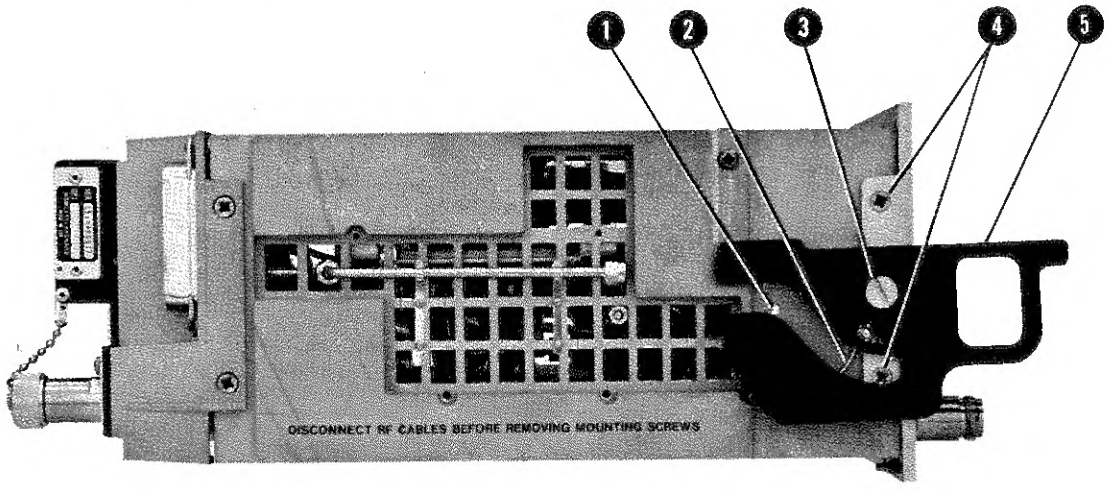


Figure 3-13. Band Indicator Lamp Replacement (1 of 2)

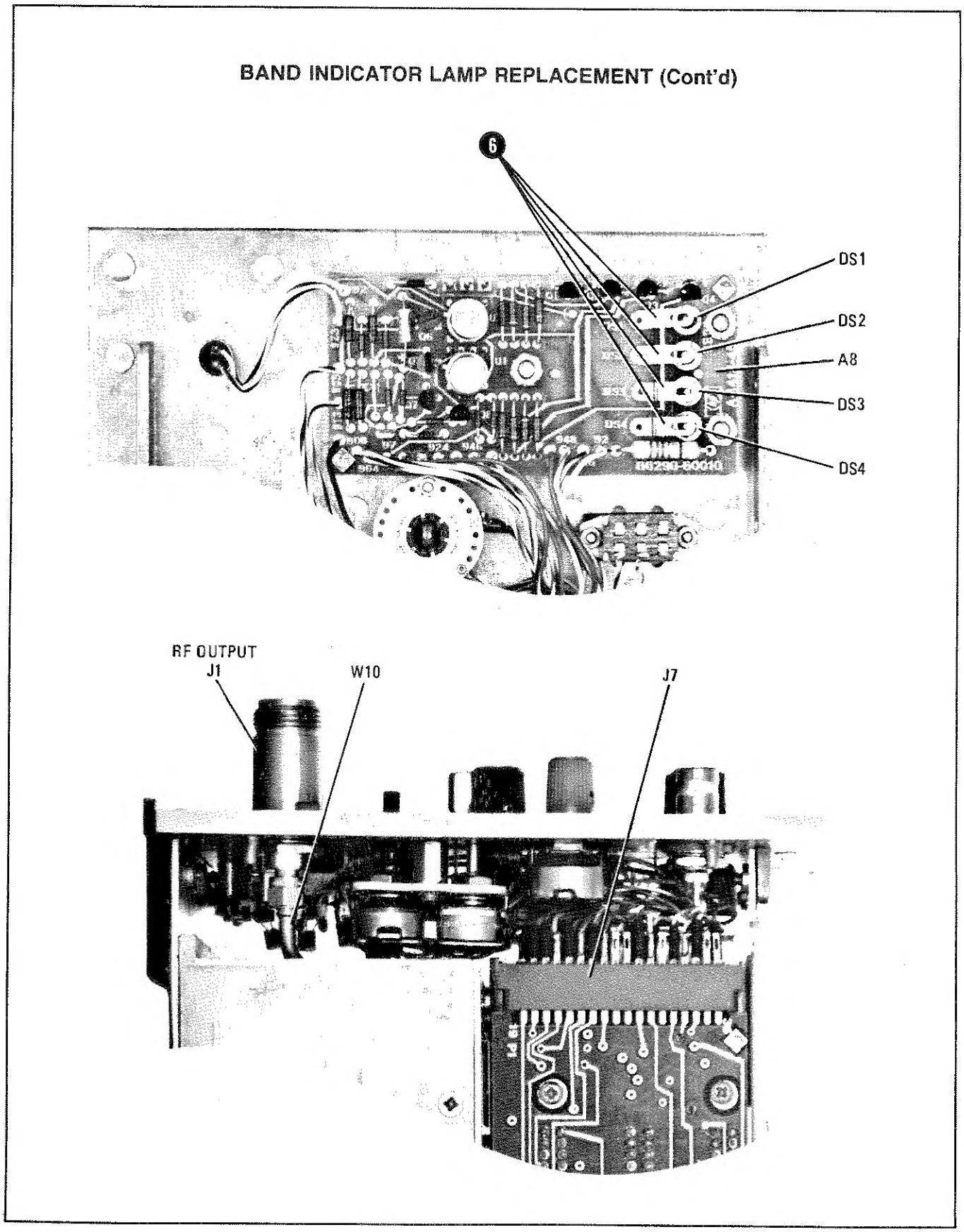


Figure 3-13. Band Indicator Lamp Replacement (2 of 2)